This user manual describes all proceedings concerning the operations of this system in detail as much as possible. However, it is impractical to give particular descriptions for all unnecessary or unallowable system operations due to the manual text limit, product specific applications and other causes. Therefore, the proceedings not indicated herein should be considered impractical or unallowable.

Preface

Your Excellency,

It's our pleasure for your patronage and purchase of this GSK983Ma Milling machining center CNC system made by GSK CNC Equipment Co., Ltd.

Safety Caution

Accident may occur by improper connection and operation！ This system can only be operated by authorized and qualified personnel. Please carefully read this manual before using！

Refer to user manual issued by the manufacturer carefully before installing, programming and operating this product, and the relative operation should be performed based upon the user manual strictly.

Security Responsibility

Security responsibility of the manufacturer

——Manufacturer should take responsibility for the design and structure danger of the CNC system and the accessories which have been eliminated and/or controlled.

——Manufacturer should take responsibility for the security of the CNC system and accessories.

——Manufacturer should take responsibility for the offered information and suggestions for the user.

Security responsibility of the users

——User should know and understand about the contents of security operations by learning and training the security operations of the CNC system.

——User should take responsibility for the security and danger because of increasing, changing or modifying the original CNC system or accessory by themselves.

——User should take responsibility for the danger without following the operations, maintenances, installations and storages described in the manual.

This manual is reserved by final user.

We are full of heartfelt gratitude to you for supporting us in the use of GSK's products.

Chinese version of all technical documents in Chinese and English languages is regarded as final.

CONTENT

THE PRECATION OF CONNECTION AND INSTALLATION

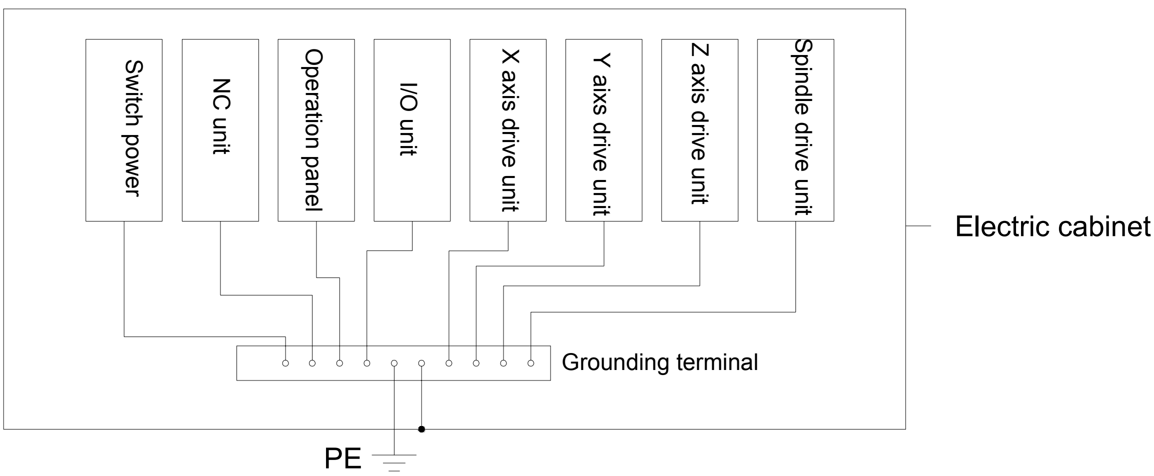
1. The power cabinet adapted with the system is only offered the specific-use of this CNC system; it is forbidden to supply this power to other devices, such as the brake, electromagnetic valve etc. otherwise, the enormous danger may occur!

2. Request of machine electric cabinet

The system installation and the machine electric cabinet of the drive unit should be adopted a totally enclosed dust-proof design, and the temperature difference both outside and inside the cabinet can not more than 10℃. A thermal exchange system should be installed if this request can not be performed. The ambient temperature of system cannot more than 45℃. It is very necessary to prevent the liquid such as the lubrication or coolant from entering the parts of system.

3. Grounding

The machine electric cabinet should be set with the protective grounding of which its continuity must conform to the request of GB 5226.1—2008. Correct grounding is an essential condition for steady system operation, and the grounding wire of each system element cannot be serially connected each other; the grounding block should be arranged inside the electric cabinet to the earth, and its resistance should be less than 0.1Ω. The protective grounding terminal of each element should be separately connected to the earth with thick and short yellow green lines.



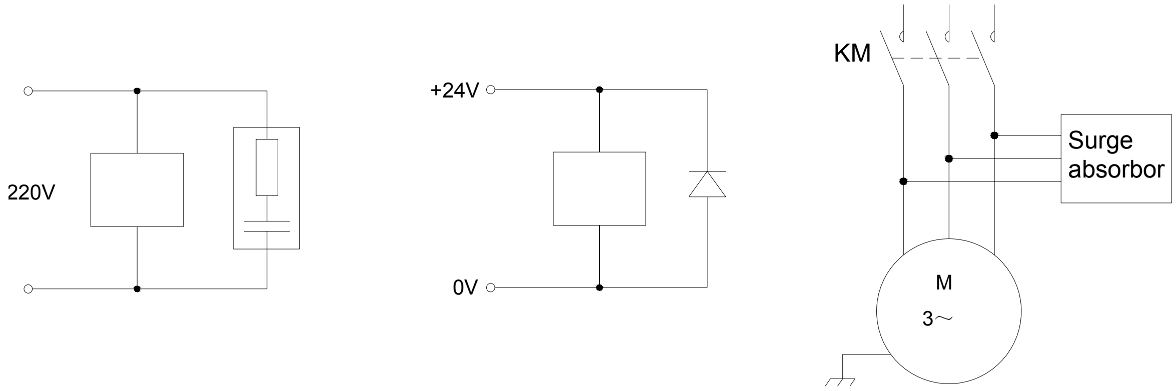
4. Supply the power by the isolation transformer

5. Layout

The connection line and the connector of the system or drive components should be firmly locked. The signal line and control line should be departed from the place where the strong electric and strong electromagnetic interference (EMI); the layout should be unbent as much as possible, which can not circle a ring, otherwise, the interference signal may occur.

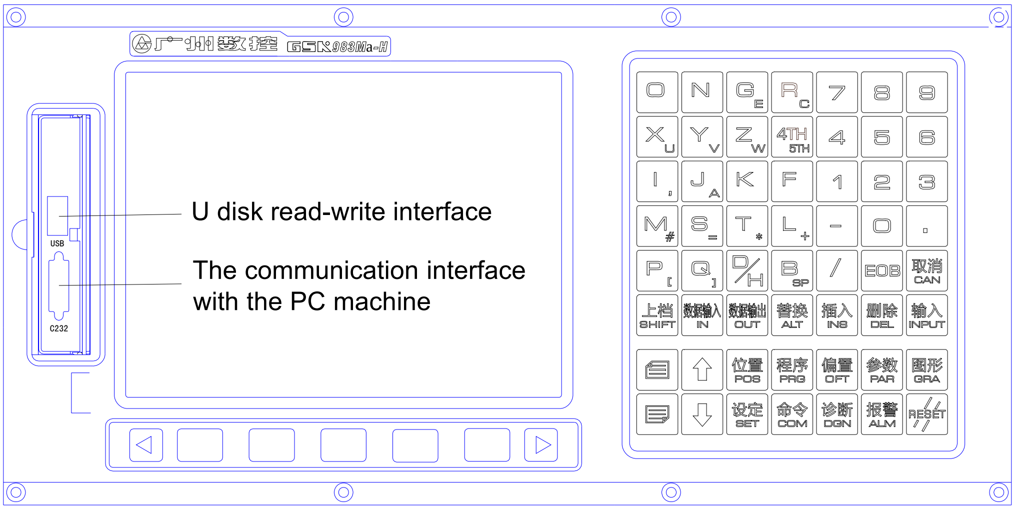
6. Suppressive interference

The RC circuit connected in parallel between two ends of AC coils; it should be closed to the sensibility load as much as possible during installing; the fly-wheel diode is connected in parallel reversely between two ends AC coils; and the surge absorber is connected in parallel at the end of the AC motor winding.

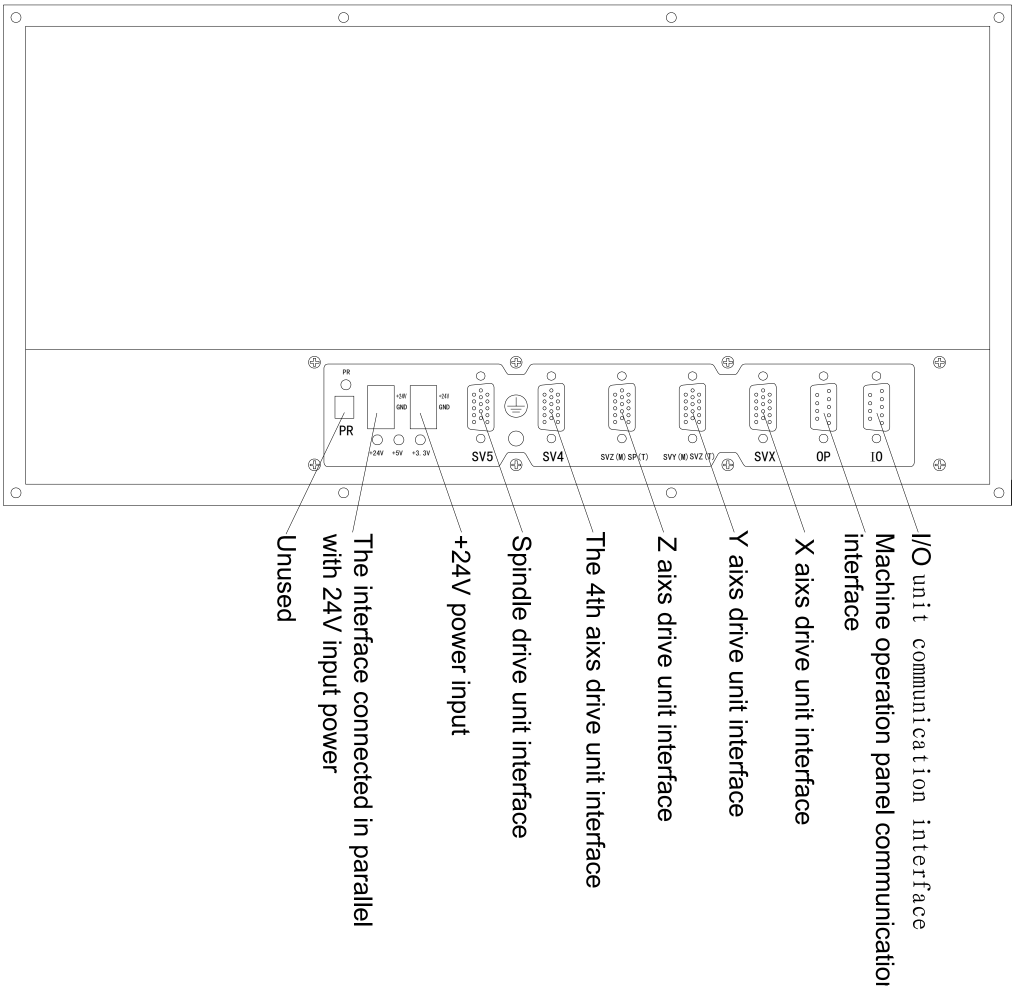


ONE　NC UNIT INTERFACE LIST

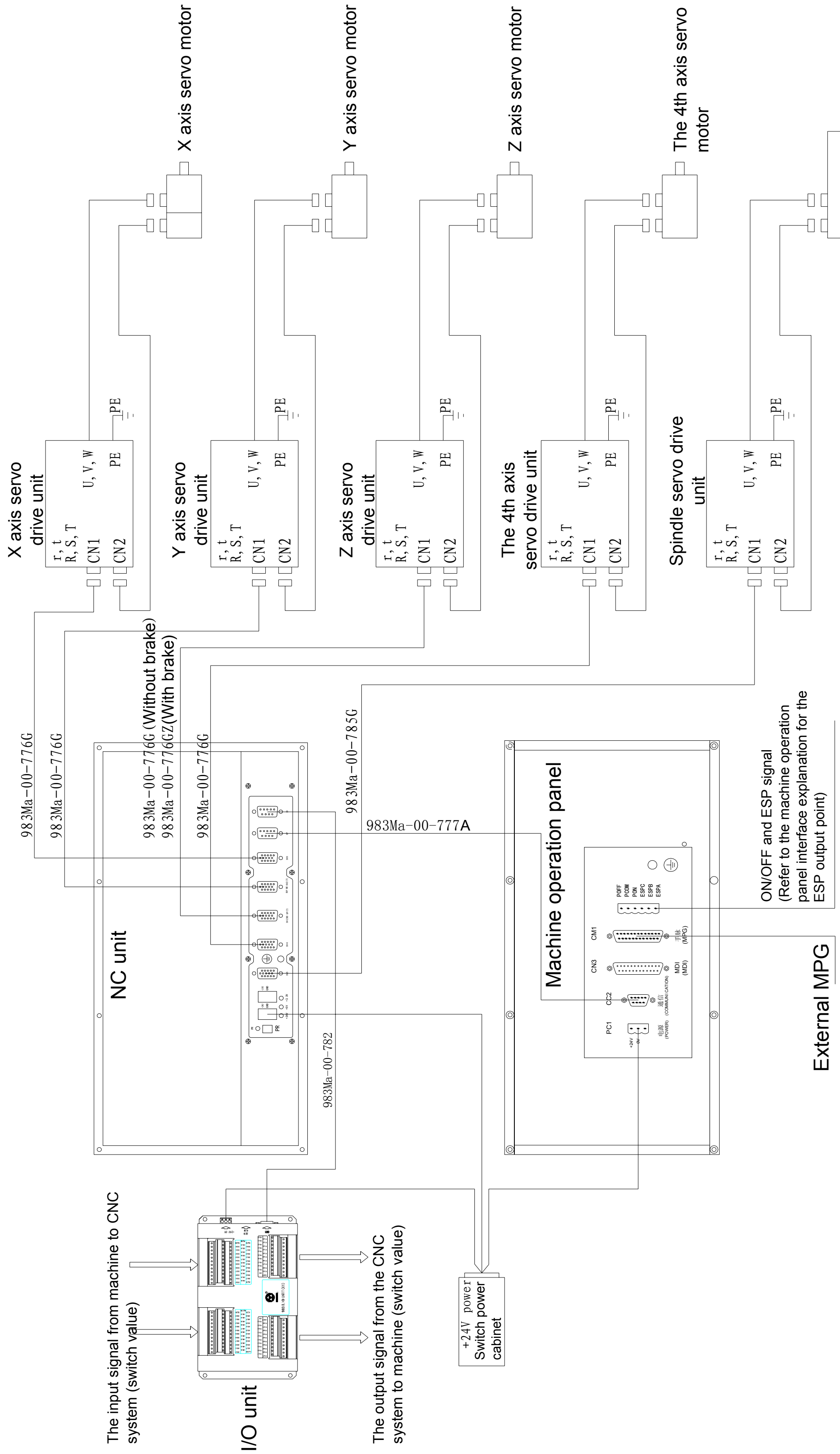
Front



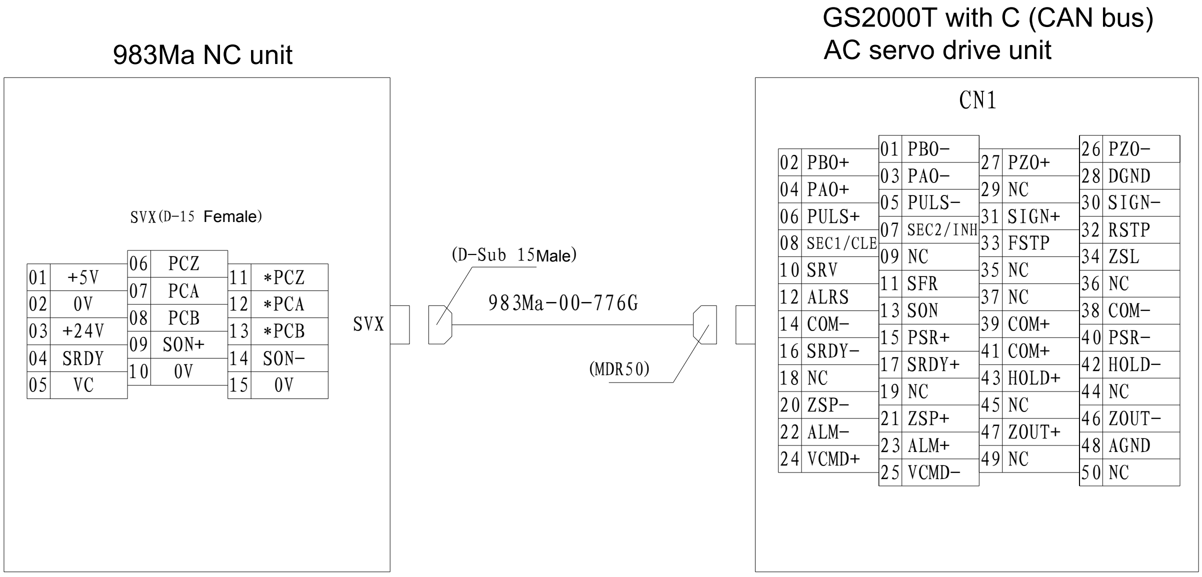
Back

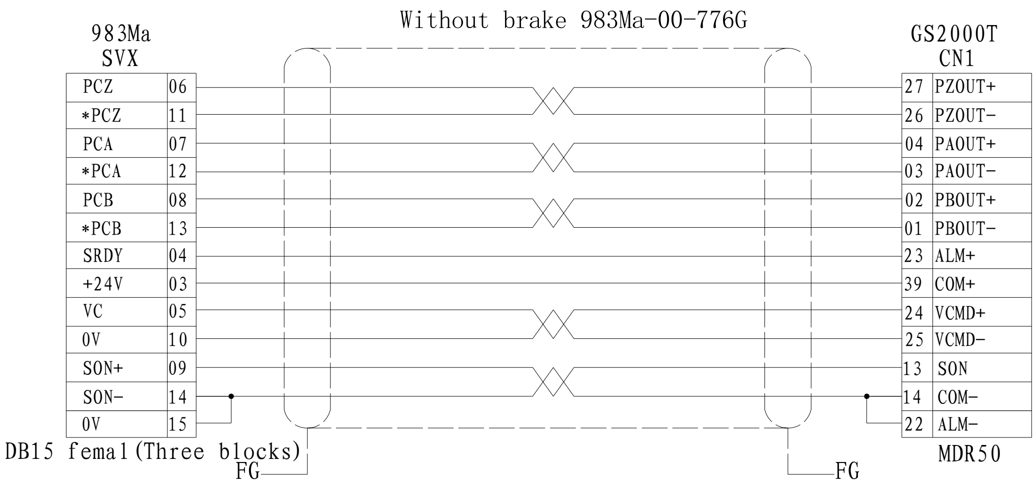


TWO INTERCONNECTION FRAME FIGURE



THREE THE CONNECTION BETWEEN NC UNIT AND GS2000T-CA1 SERIES DRIVE UNIT (WITHOUT BRAKE)

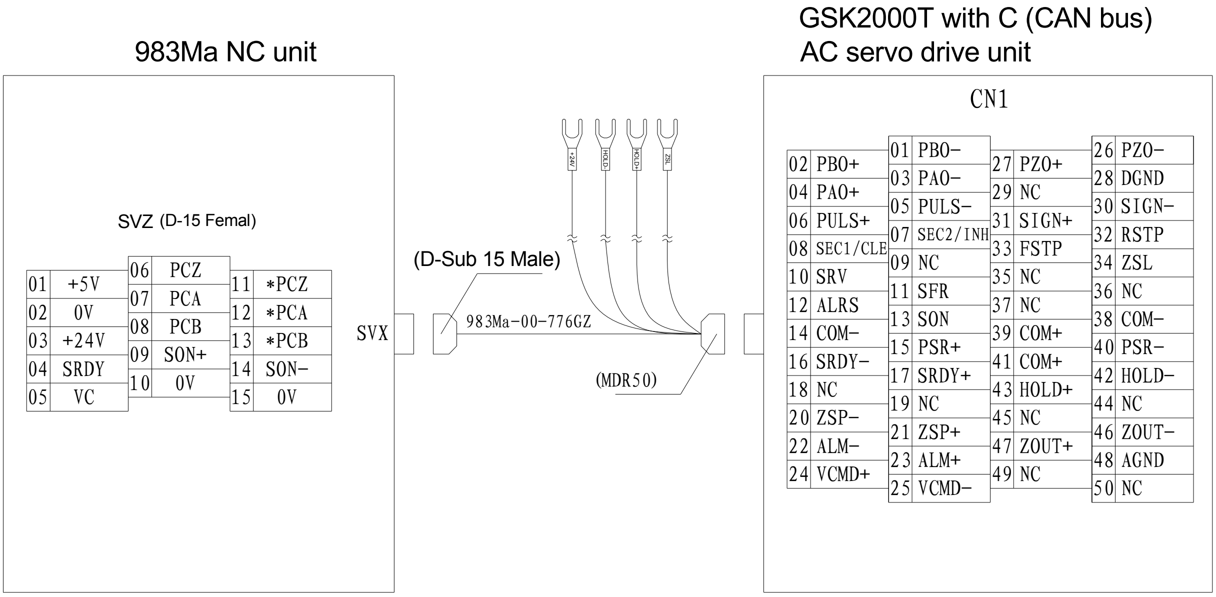


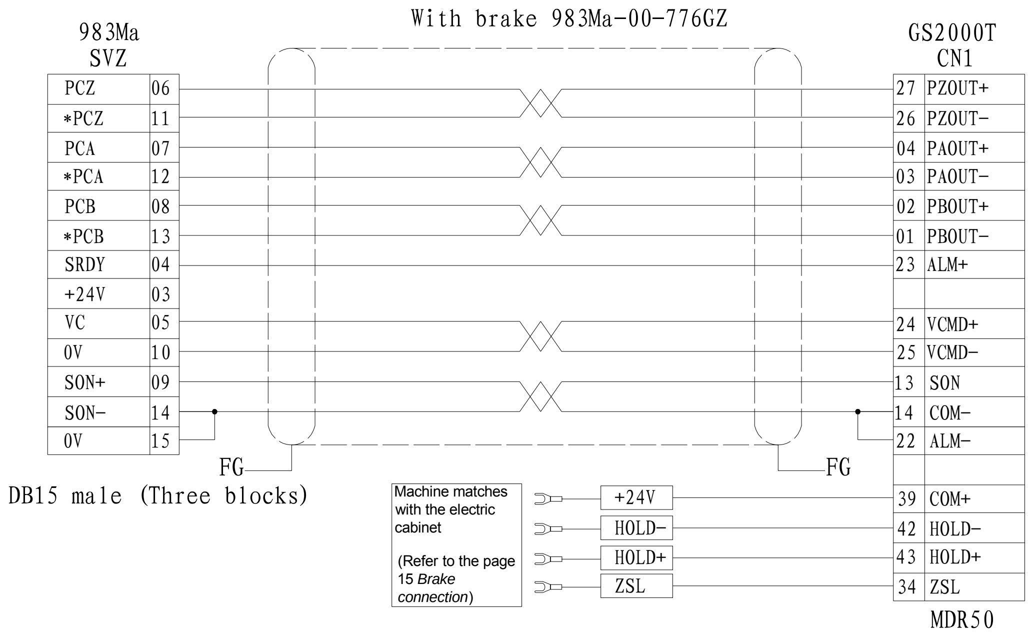


PCA *PCA: Encoder feedback A phase difference signal (Pulse signal, drive→NC)
PCB *PCB: Encoder feedback B phase difference signal (Pulse signal, drive→NC)
PCZ *PCZ: Encoder feedback Z phase difference signal (Pulse signal, drive→NC)
SON+/-: Enabling signal (switch signal, NC→drive)
SRDY: Servo ready signal (Switch signal, drive→NC)
VC: Speed control voltage (DC current, NC→drive)

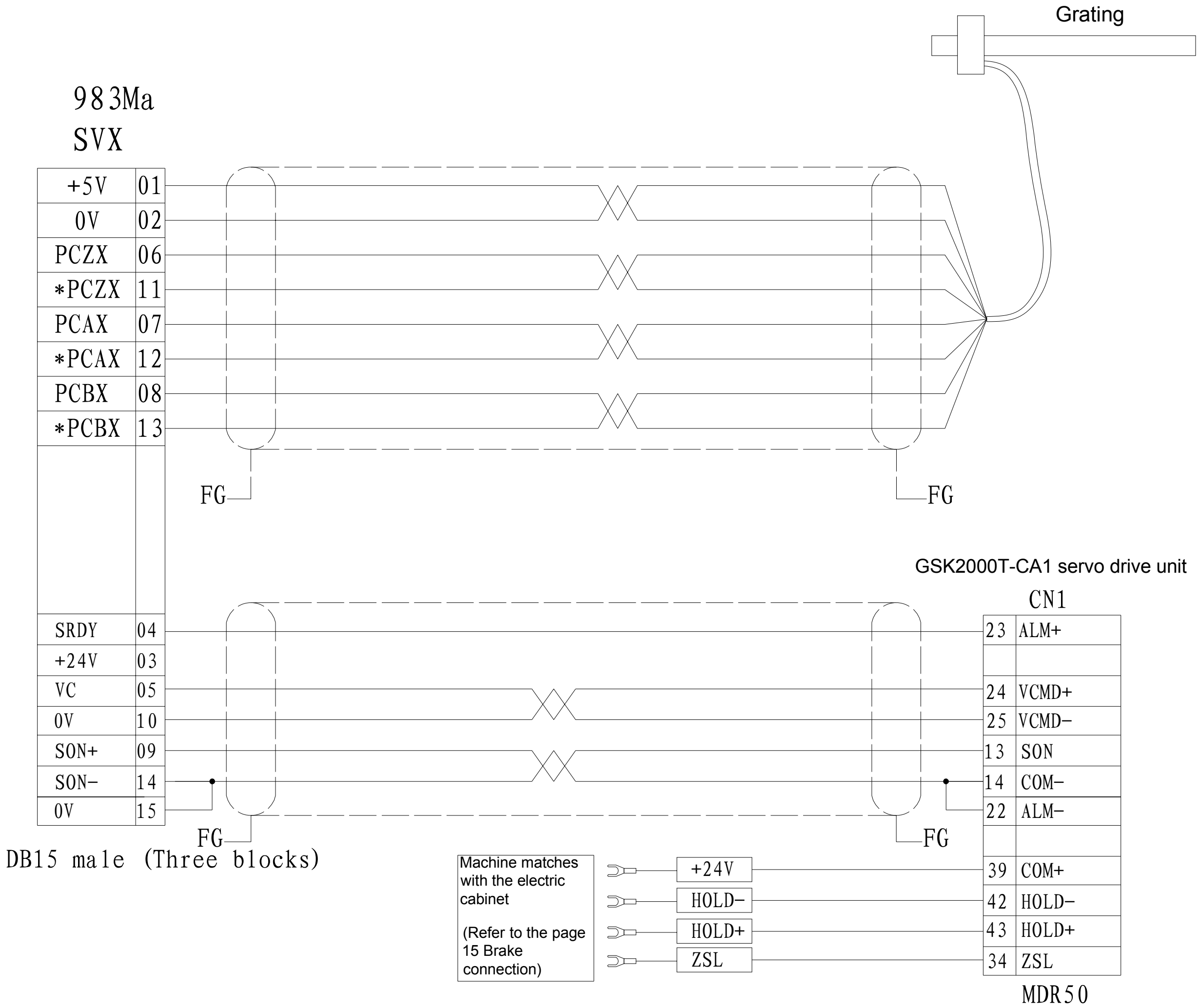
Note: The connection of the X, Y, Z and the 4th axes are identical when the Z axis is without brake. Refer to the next page when the Z axis is with brake.

FOUR THE CONNECTION BETWEEN NC UNIT AND GS2000T-CA1 SERIES DRIVE UNNIT (WITH BRAKE)

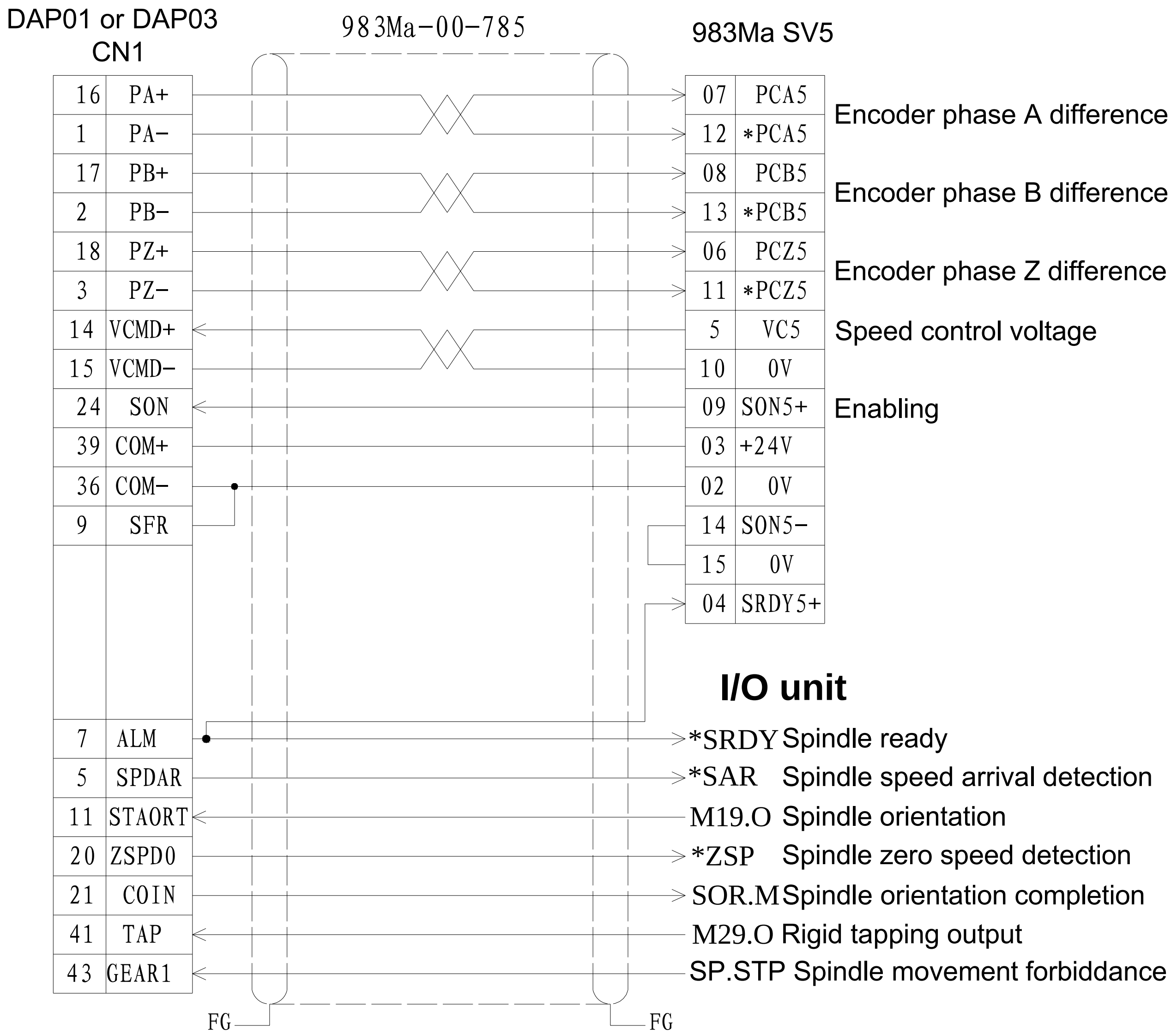




FIVE THE FULL-CLOSED CONNECTION WITH THE GRATING



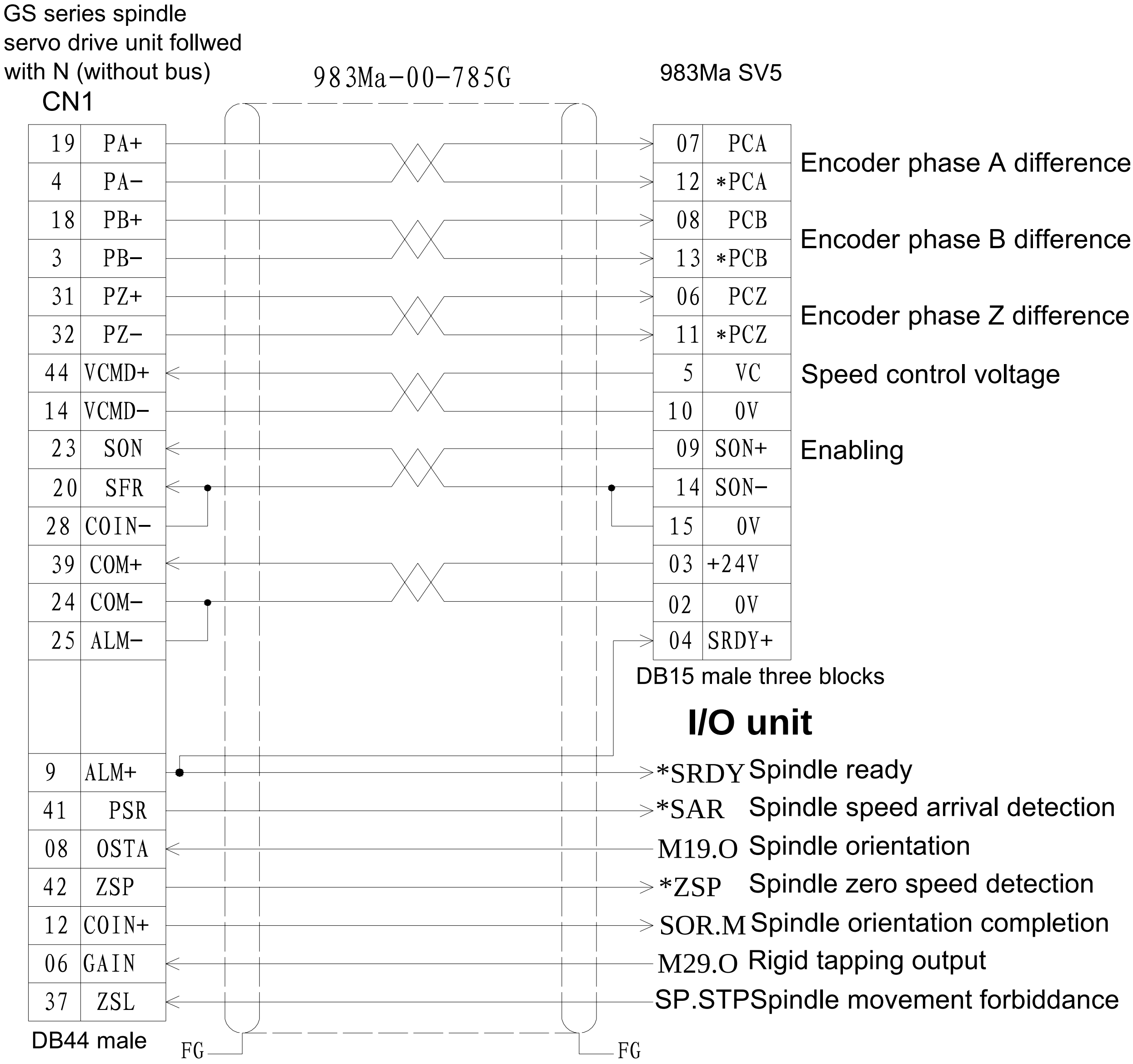
SIX THE CONNECTION BETWEEN NC UNIT AND DAP03 SPINDLE DRIVE UNIT



Note 1: Where the above-mentioned corresponding I/O points are performed in its unit, just refer to the corresponding version PLC User Manual.

2: The signal from where the spindle servo unit outputs to the I/O unit or, or opposite, which is the collector output type, that is, it is the low level signal connecting with the 0V when it is enabled.

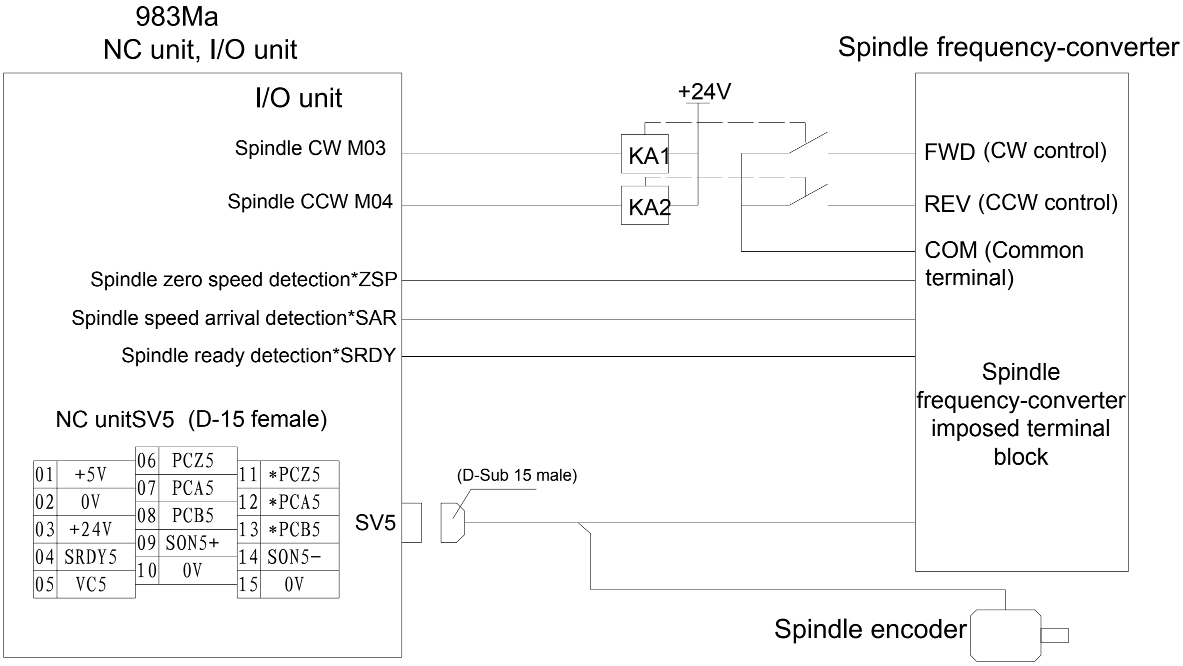
SEVEN THE CONNECTION BETWEEN NC UNIT AND GS3000Y-NP2 SPINDLE SERVO DRIVE UNIT



Note: 1. Where the above-mentioned corresponding I/O points are performed in its unit, just refer to the corresponding version PLC User Manual.

2. The signal from where the spindle servo unit outputs to the I/O unit or, or opposite, which is the collector output type, that is, it is the low level signal connecting with the 0V when it is enabled.

EIGHT THE CONNECTION BETWEEN NC UNIT AND SPINDLE FREQENCY-CONVERTER



Note 1: Where the above-mentioned corresponding I/O points (such as the M03 and M04 etc.) are performed in its unit, just refer to the corresponding version PLC User Manual.

Note 2: Spindle speed reaches to the detection signal *SAR which should be short-connected to the 0V (The input point is enabled when it is low level) or the 24V (The input point is enabled when it is high level) if it does not use.

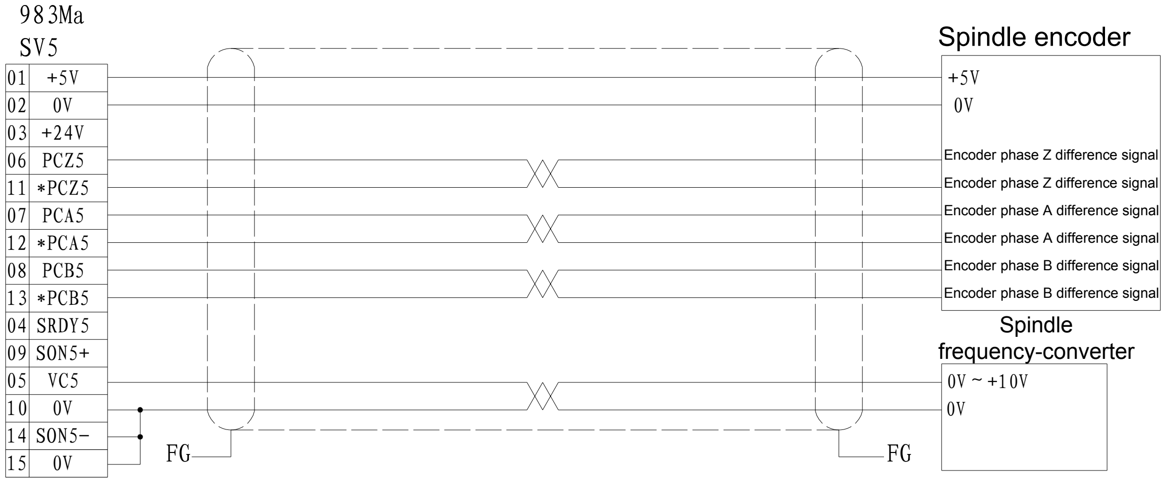
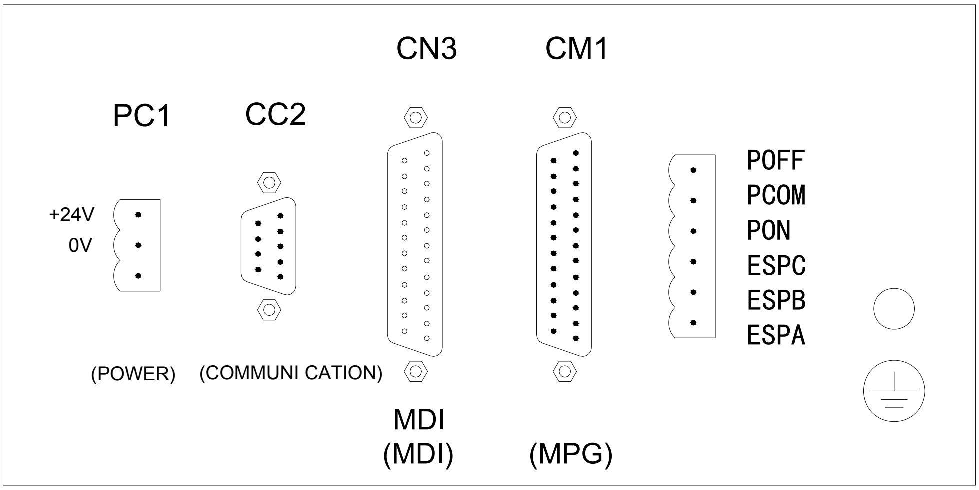
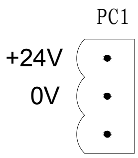


Fig. 2: The connection with the spindle encoder
(983Ma-00-775)

NINE MACHINE OPERATOR PANEL INTERFACE





- POFF (Power off)
- PCOM (Power switch common terminal)
- PON (Power on)
- ESPC (ESP chain leading terminal 2)
- ESPB (ESP switch leading terminal on operation panel)
- ESPA (ESP switch leading terminal 1 on operation panel;ESP chain leading terminal 1)

CC2 (D-9 male)

Pin	Signal	Pin	Signal
01	0V	06	TD-
02	TD+	07	RD-
03	RD+	08	HA-
04	HA+	09	HB-
05	HB+		

RD+ RD-：RS422 difference recieving port

TD+ TD-：RS422 difference delivery port

HA+ HA-: MPG phase A pulse output

HA+ HA-: MPG phase B pulse output

Communication

CN3(D-25 female）unused

CM1 (D-25 male)

Pin	Signal	Pin	Signal
01	HX	14	HY
02	HZ	15	H4
03	H5	16	×1
04	×10	17	×100
05	+L (24V)	18	-L (0V)
06	ESP2	19	ESP1
07		20	0V
08	HA+	21	HA-
09	HB+	22	HB-
10	0V	23	
11	0V	24	
12	+5V	25	
13	+5V		

HX, HY, HZ, H4, H5: External MPG axis signal selection

x1, x10, x100: External MPG override signal selection

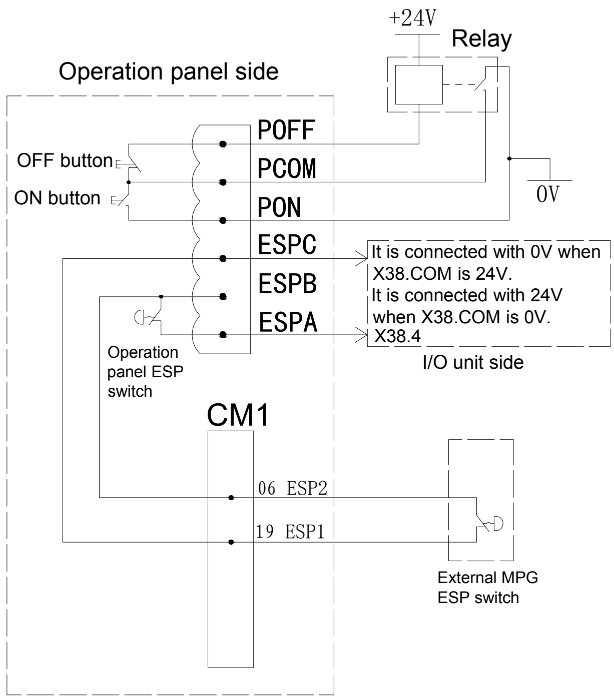
-L, +L: Two poles of external MPG indicator

ESP2, ESP1: Two poles of external MPG ESP switch

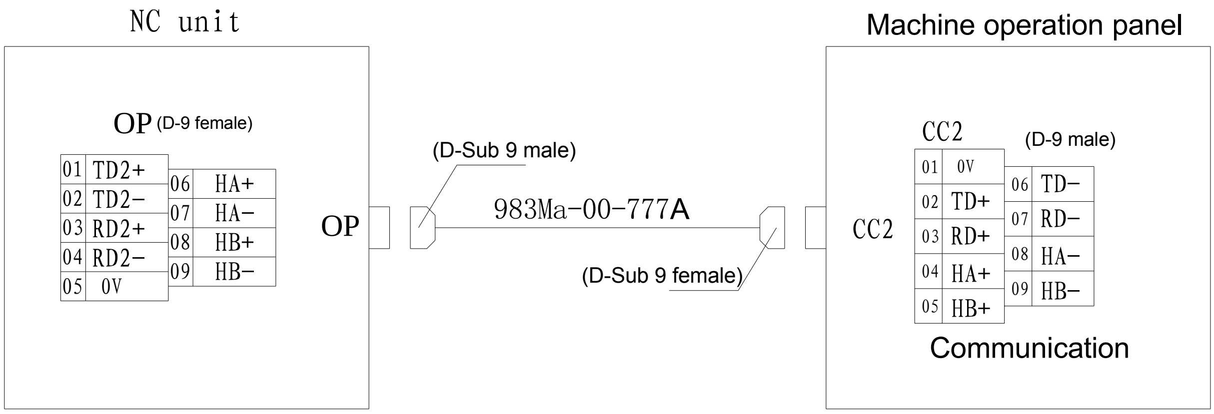
HA+, HA-: External MPG phase A pulse input

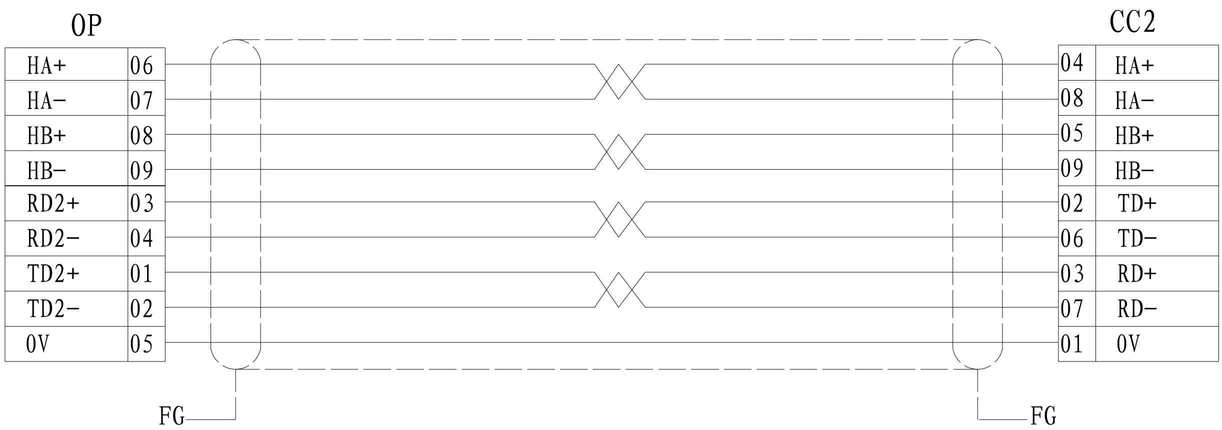
HB+, HB-: External MPG phase B pulse input

MPG



TEN THE CONNECTION BETWEEN NC UNIT AND OPERATION PANEL





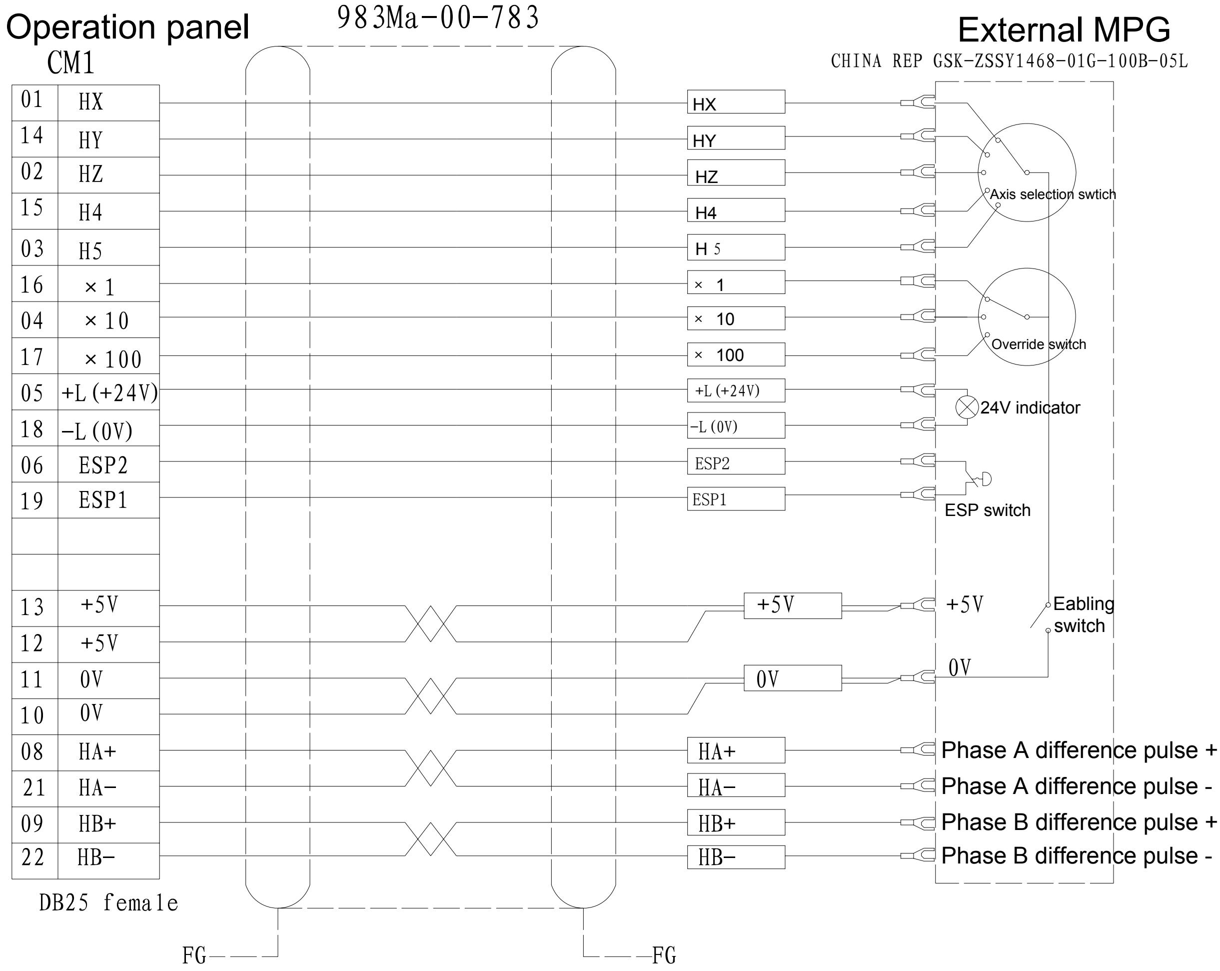
RD2+ RD2-：RS422 difference reciving terminal

TD2+ TD2-：RS422 difference delivery terminal

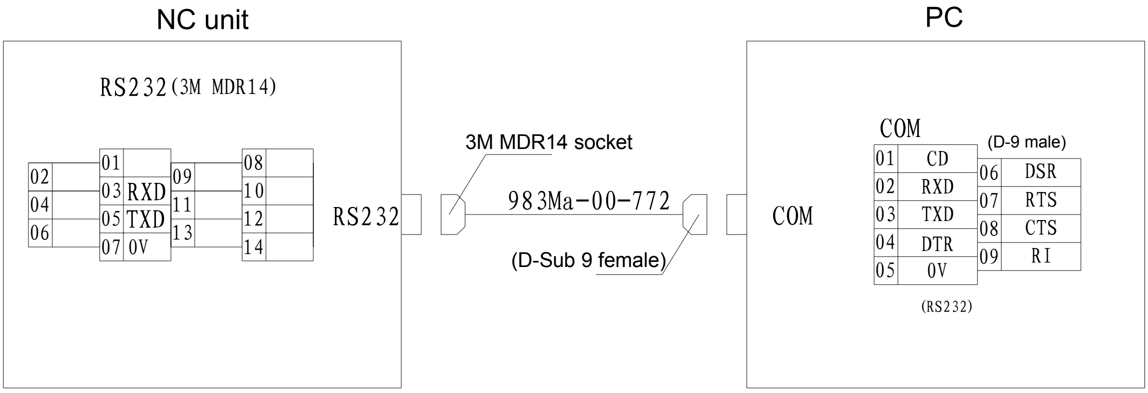
HA+ HA- :MPG phase A signal input

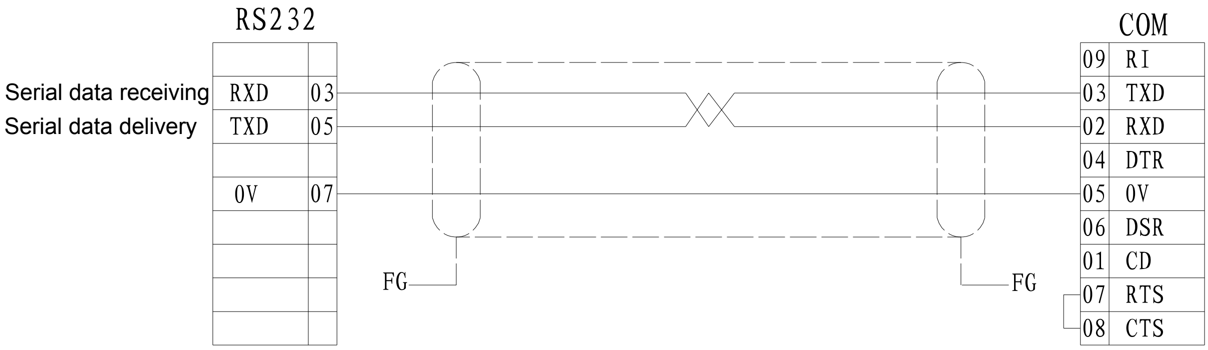
HB+ HB- :MPG Phase B signal input

ELEVEN THE CONNECTION BETWEEN EXTERNAL MPG AND OPERATION PANEL



TWELVE　THE CONNECTION BETWEEN NC UNIT AND PC MACHINE

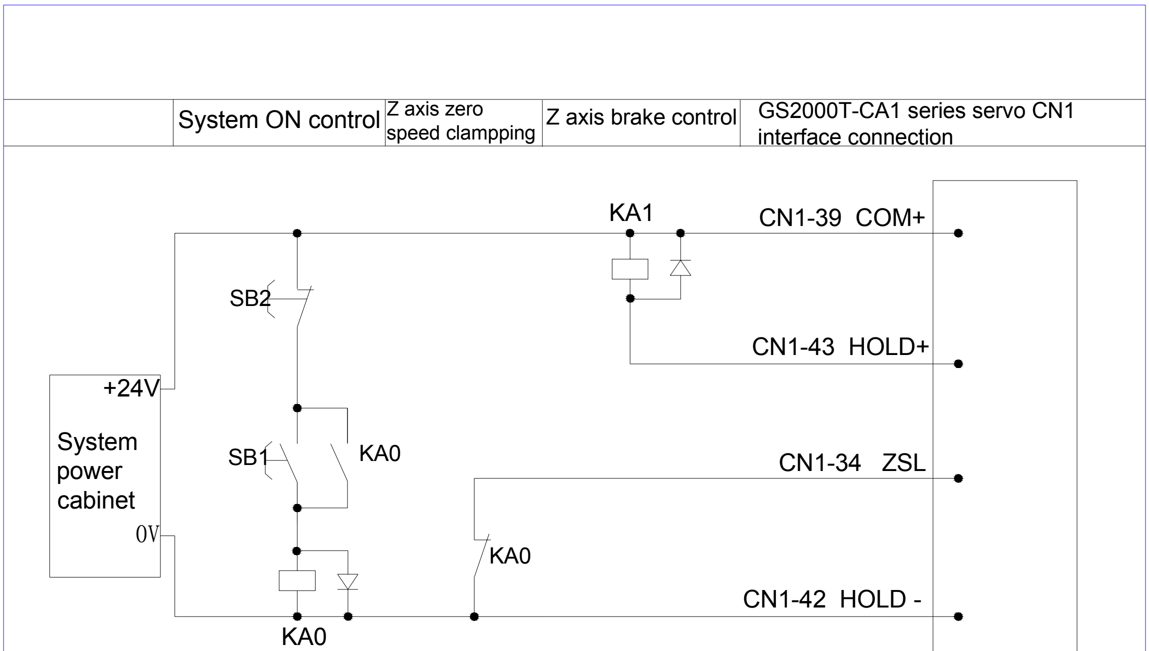




Note: Both the NC and the computer PC shell should be grounded reliably.

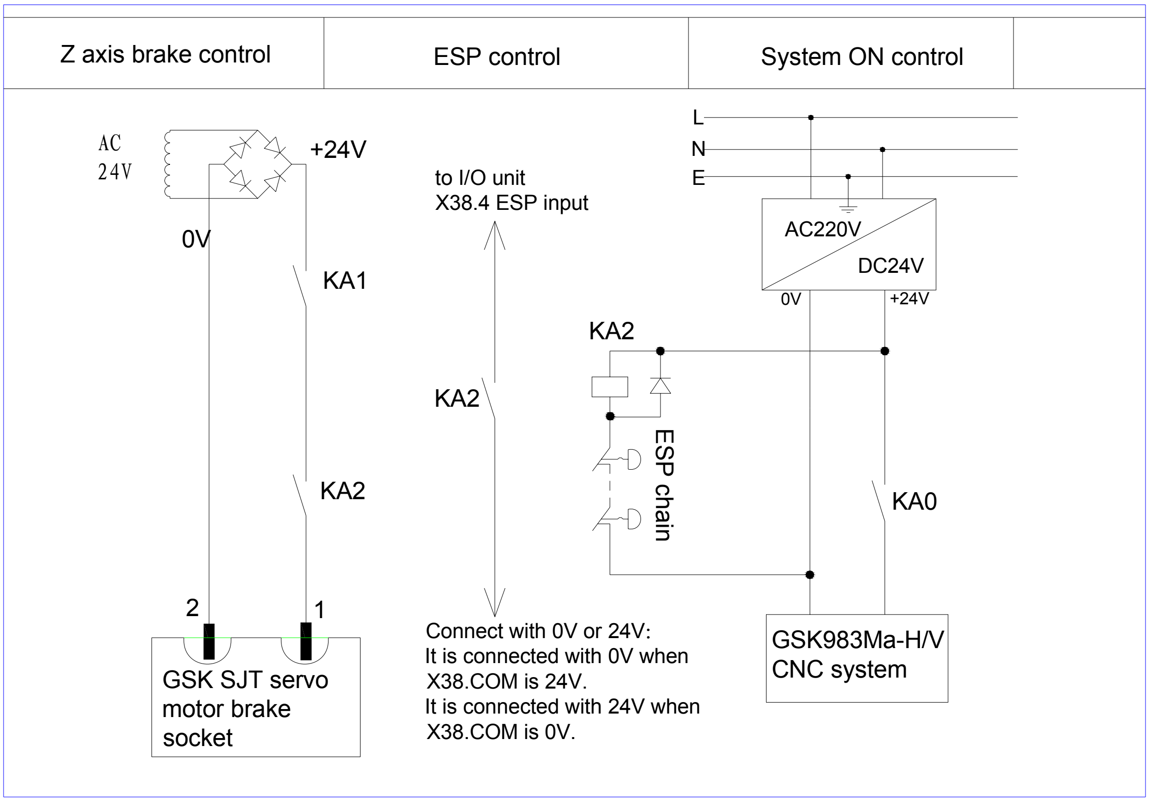
THIRTEEN THE CONNECTION METHOD OF THE Z AXIS BRAKE AND SYSTEM POWER-ON CONTROL

It matches with GS2000T-CA1 series

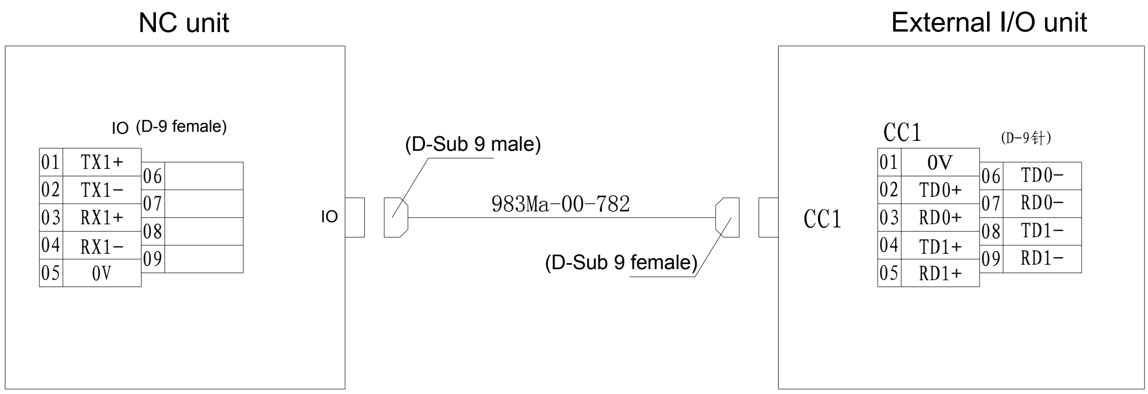


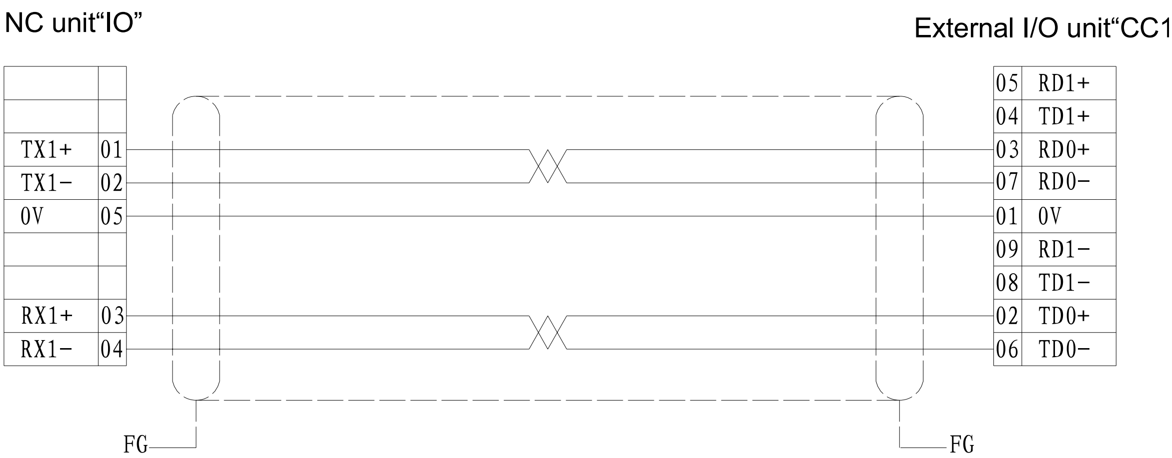
Z axis servo drive unit CN1 socket of GS2000T-CA1 series

GSK2000T-CA1 series servo drive CN1 socket leading signal terminal significance	
HOLD-	Servo drive unit brake output -
COM+	Power supply +24V
ZSL	Servo drive unit zero speed clamping input
HOLD+	Servo drive unit brake output +



FOURTEEN THE CONNECTION BETWEEN NC UNIT AND I/O UNIT

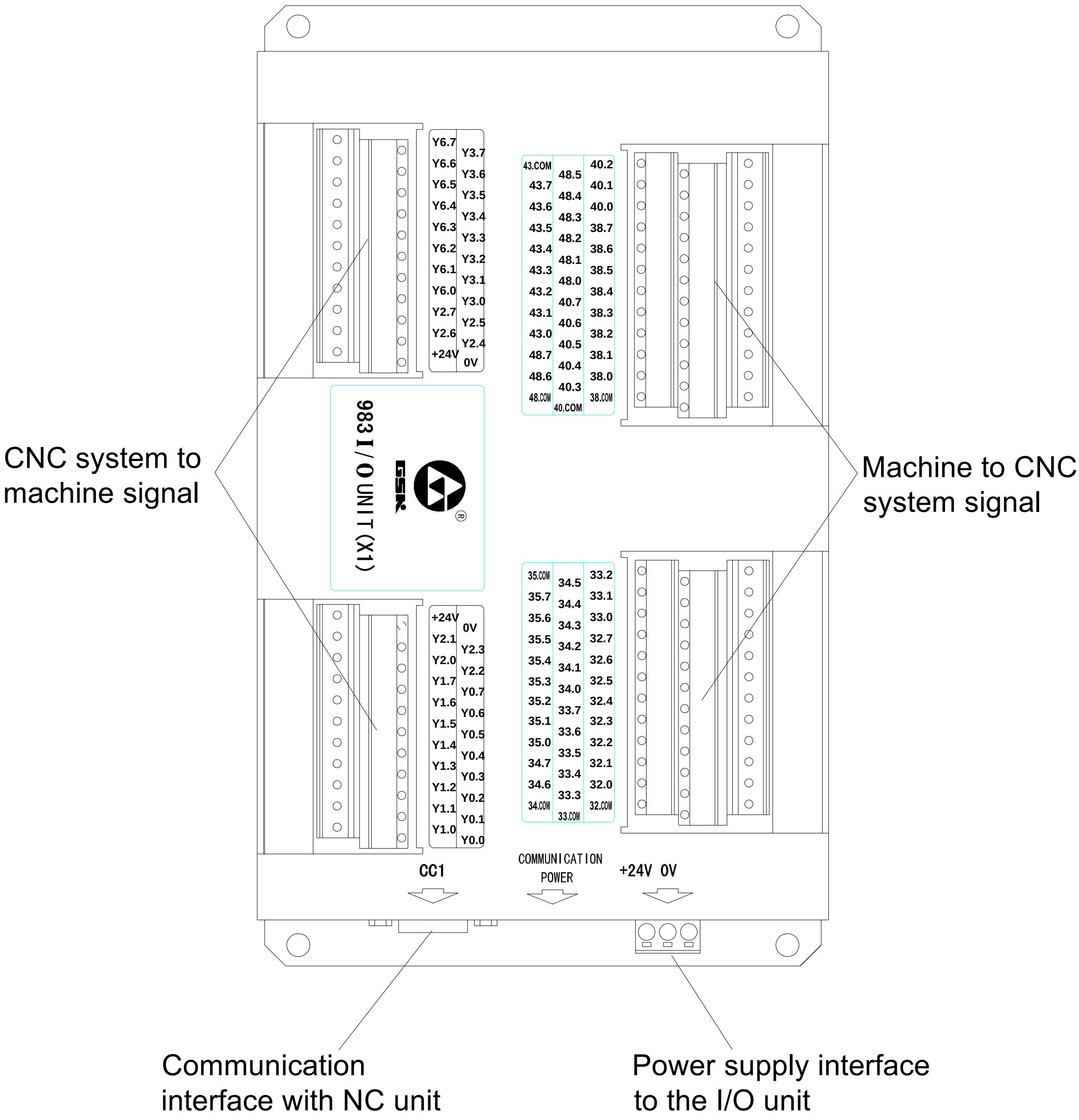




TX1+，TX1-：RS422 difference signal delivery

RX1+，RX1-：RS422 difference signal receiving

FIFTEEN THE BRIEF OF THE EXTERNAL I/O UNIT (X1) INTERFACE



SIXTEEN THE CIRCUIT CONNECTION OF THE I/O UNIT (X1) INPUT/OUTPUT SIGNAL

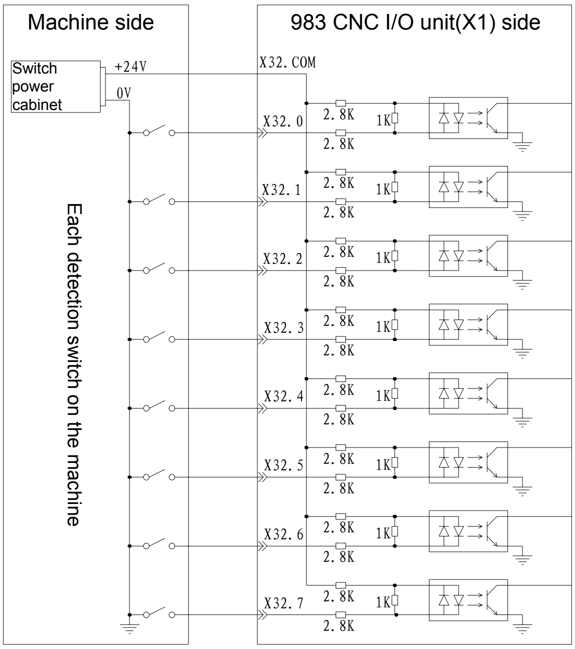
I. Signal input

The COM terminal of each group address is determined whether this group is enabled in the High level or Low one.

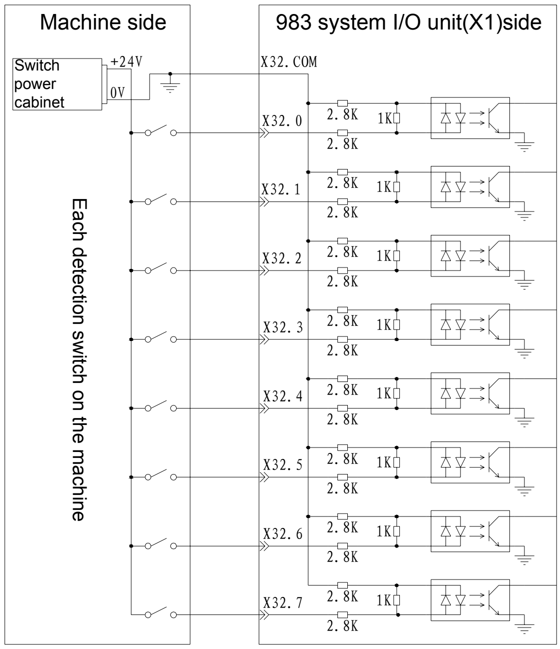
When COM terminal connects to the 24V, each input point is enabled connecting with the Low level (0V);

When COM terminal connects to the 0V, each input point is enabled connecting with the High level (24V).

The connection with the enabled Low level



The connection with the enabled High level

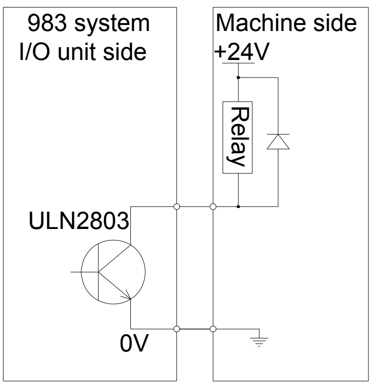


Note: Totally 64 points of 8 groups input points, X32.0-X32.7 is regarded as a example, the connection of other groups are identical.

II. Signal output

Totally 40 points that are regarded as the ULN 2803 output; the top current throughout each point is 200mA.

Output point connection schema



SEVENTEEN I/O UNIT (X1) INPUT/OUTPUT POINT DEFINITION

The points with the function definition have been marked in the following table, which can not be changed because it is fixed inside the system, and therefore, the user can not define it freely. The other points' functions can be determined by PLC programming. If user uses the GSK standard 983Ma PLC, refer to the corresponding version PLC User Manual for the function definition of each point.

Pin	PLC address	Signal name	Signal function	I/O
X32.COM		**X32 common terminal**	The level selection of the X32 group	
X32.0	**X32.0**	***+LX (Fixed)**	+X limit (short-circuit to 0V if unused)	I
X32.1	**X32.1**	***-LX (Fixed)**	-X limit (short-circuit to 0V if unused)	I
X32.2	X32.2			I
X32.3	X32.3			I
X32.4	X32.4			I
X32.5	**X32.5**	***DECX (Fixed)**	Zero return deceleration switch along X axis	I
X32.6	X32.6			I
X32.7	X32.7			I
X33.COM		**X33 common terminal**	The level selection of the X33 group	
X33.0	**X33.0**	***+LY (Fixed)**	+Y limit (short-circuit to 0V if unused)	I
X33.1	**X33.1**	***-LY (Fixed)**	-Y limit (short-circuit to 0V if unused)	I
X33.2	X33.2			I
X33.3	X33.3			I
X33.4	X33.4			I
X33.5	**X33.5**	***DECY (Fixed)**	Zero return deceleration along Y axis	I
X33.6	X33.6			I
X33.7	X33.7			I
X34.COM		**X34 common terminal**	The level selection of the X34 group	
X34.0	**X34.0**	***+LZ (Fixed)**	+Z limit (short-circuit to 0V if unused)	I
X34.1	**X34.1**	***-LZ (Fixed)**	-Z limit (short-circuit to 0V if unused)	I
X34.2	X34.2			I
X34.3	X34.3			I

X34.4	X34.4			I
X34.5	**X34.5**	***DECZ (Fixed)**	Zero return deceleration along Z axis	I
X34.6	X34.6			I
X34.7	X34.7			I
X38.COM		**X38 common terminal**	The level selection of the X38 group	
X38.0	X38.0			I
X38.1	X38.1			I
X38.2	X38.2			I
X38.3	X38.3			I
X38.4	**X38.4**	***ESP (Fixed)**	ESP (Input)	I
X38.5	X38.5			I
X38.6	X38.6			I
X38.7	X38.7			I
X48.COM		**X48 common terminal**	The level selection of the X48 group	
X48.0	X48.0	***+L5 (Fixed)**	The 5th axis positive limit	I
X48.1	X48.1	***-L5 (Fixed)**	The 5th negative limit	I
X48.2	X48.2			I
X48.3	X48.3			I
X48.4	X48.4			I
X48.5	X48.5	***DEC5 (Fixed)**	The *5 axis zero return deceleration	I
X48.6	X48.6			I
X48.7	X48.7			I
X43.COM		**X43 common terminal**	The level selection of the X43 group	
X43.0	X43.0			I
X43.1	X43.1			I
X43.2	X43.2			I
X43.3	X43.3			I
X43.4	X43.4			I
X43.5	X43.5			I
X43.6	**X43.6**	**SKIP.M**	Skip signal input	I
X43.7	X43.7			I
X35.COM		**X35 common terminal**	The level selection of the X35 group	
X35.0	**X35.0**	***+L4 (Fixed)**	The 4th positive limit	I
X35.1	**X35.1**	***-L4 (Fixed)**	The 4th negative limit	I

X35.2	X35.2			I
X35.3	X35.3			I
X35.4	X35.4			I
X35.5	**X35.5**	***DEC4 (Fixed)**	The 4th axis zero return deceleration	I
X35.6	X35.6			I
X35.7	X35.7			I
X40.COM		**X40 common terminal**	The level selection of the X40 group	
X40.0	X40.0			I
X40.1	X40.1			I
X40.2	X40.2			I
X40.3	**X40.3**			I
X40.4	**X40.4**			I
X40.5	X40.5			I
X40.6	X40.6			I
X40.7	X40.7			I

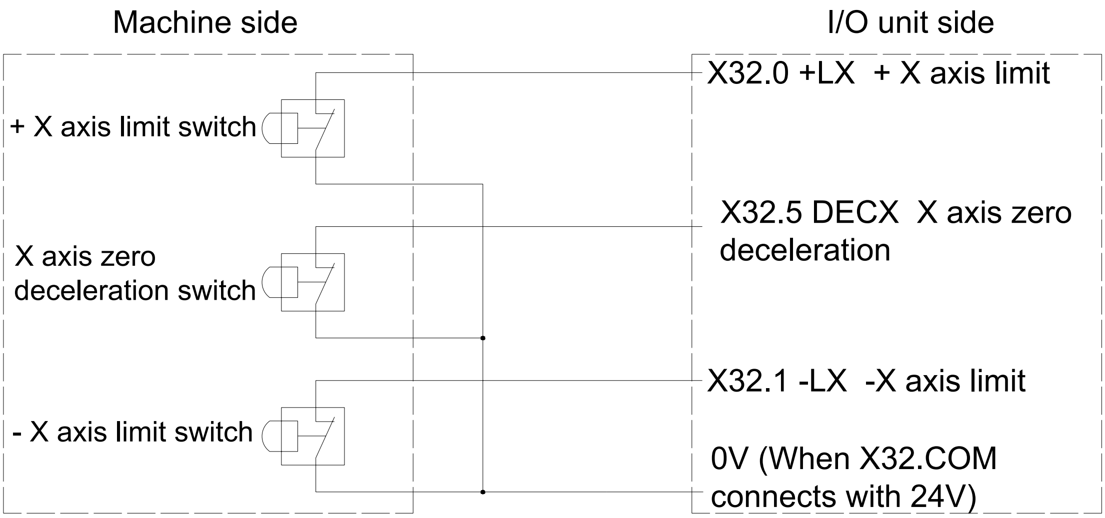
Pin.	**PLC address**	**Signal name**	**Signal function**	**I/O**
Y0.0	Y0.0			O
Y0.1	Y0.1			O
Y0.2	Y0.2			O
Y0.3	Y0.3			O
Y0.4	Y0.4			O
Y0.5	Y0.5			O
Y0.6	Y0.6			O
Y0.7	Y0.7			O
Y1.0	Y1.0			O
Y1.1	Y1.1			O
Y1.2	Y1.2			O
Y1.3	Y1.3			O
Y1.4	Y1.4			O
Y1.5	Y1.5			O
Y1.6	Y1.6			O
Y1.7	Y1.7			O
Y2.0	Y2.0			O

Y2.1	Y2.1			O
Y2.2	Y2.2			O
Y2.3	Y2.3			O
0V			24V power grounding	
+24V			24V power output	O
Y3.0	Y3.0			O
Y3.1	Y3.1			O
Y3.2	Y3.2			O
Y3.3	Y3.3			O
Y3.4	Y3.4			O
Y3.5	Y3.5			O
Y3.6	Y3.6			O
Y3.7	Y3.7			O
Y6.0	Y6.0			O
Y6.1	Y6.1			O
Y6.2	Y6.2			O
Y6.3	Y6.3			O
Y6.4	Y6.4			O
Y6.5	Y6.5			O
Y6.6	Y6.6			O
Y6.7	Y6.7			O
Y2.4	Y2.4			O
Y2.5	Y2.5			O
Y2.6	Y2.6			O
Y2.7	Y2.7			O
0V			24V power grounding	
+24V			24V power output	O

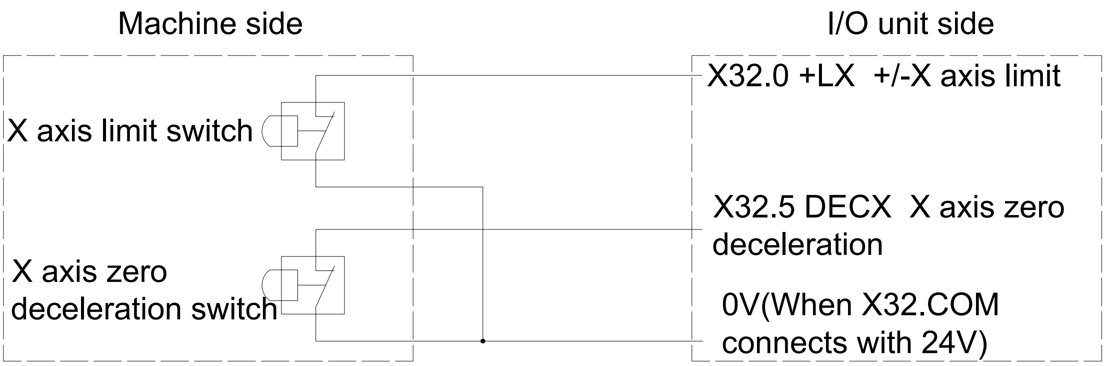
EIGHTEEN THE CONNECTION OF THE ZERO AND LIMIT SWITCH

The X axis is regarded as an example:

1. Double contact points connection (The NC parameter 609.5 is set to 0):



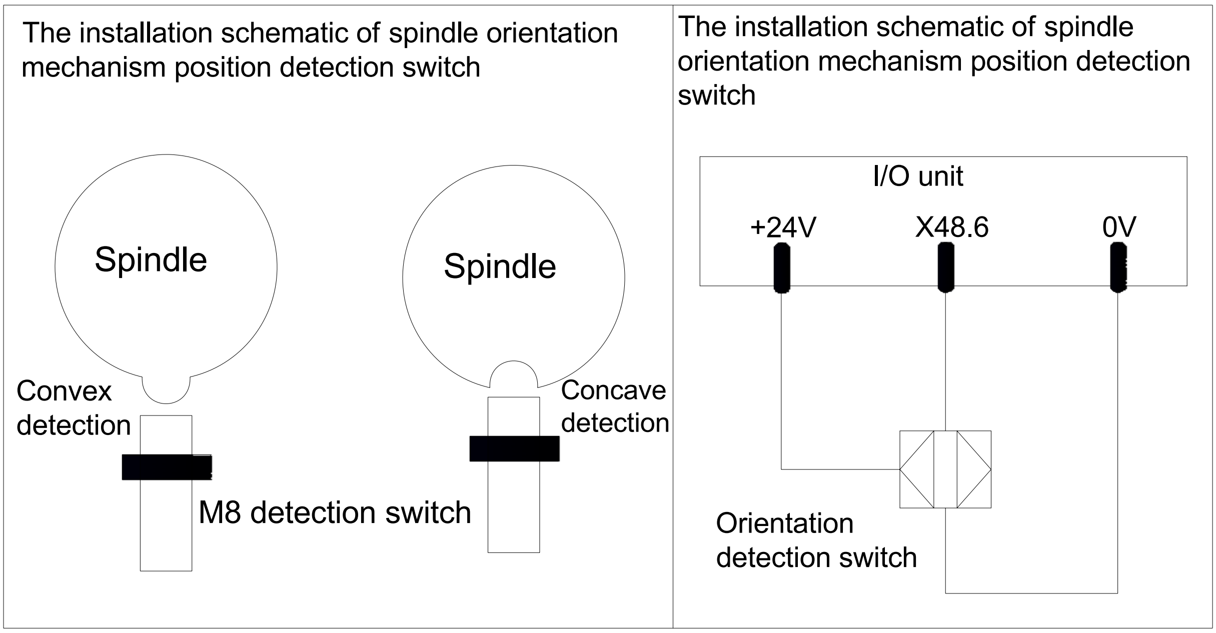
2.Single contact point connection (The NC parameter 609.5 is set to 1):



Note: The system that is positive or negative limit can be judged based upon the axis movement direction in the single contact point connection. Only one switch can be required of the positive/negative limit, which its signal must be connected on the X32.0 (X axis), if the Y, Z, the 4th and the 5th axes are separately corresponding to the X33.0, X34.0, X35.0 and X48.0. The negative limit points X32.1, X33.1, X34.1, X35.1 and X48.1 are disabled.

NINETEEN THE RELATIVE EXPLANATION OF INSTALLING THE MECHANICAL POSITION DETECTION SWITHC OF THE SPINDLE ORIENTATION

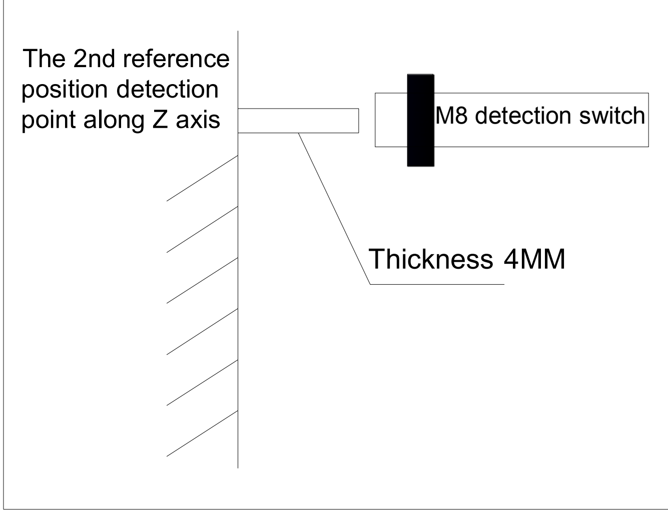
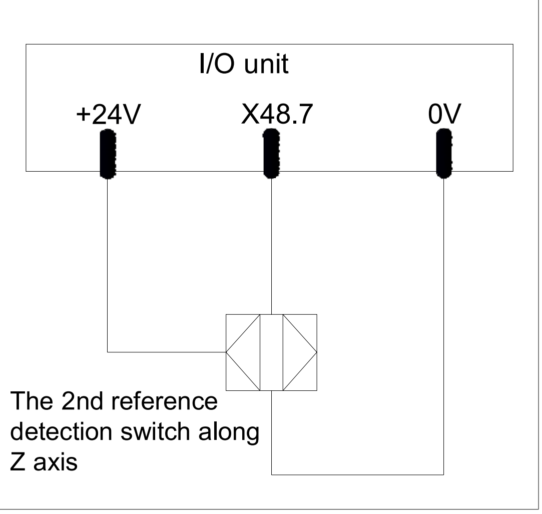
In order to further enhance the accuracy and reliable of the spindle orientation, and protect the tool magazine and tool, the 983M system adds the spindle orientation mechanical position confirmation signal. The system detects both the traditional spindle servo drive orientation signal and the spindle orientation mechanical position confirmation signal during the tool-change. I/O unit X48.6 is the input point of the spindle orientation mechanical position confirmation signal. The machine manufacturer can install the corresponding orientation positioning detection switch based upon the actual case of the machine spindle, (It is recommended to adopt the approximate switch value is M8, and the detection distance is more than 1mm). Which detection method (concave or protrude) is decided by the machine manufacturer. The PC parameter 3004.7 of the CNC can be selected the constant open or close mode of the detection switch (The factory default PC parameter 3004.7=0, constant open switch, concave detection). If it is the constant close switch and it performed concave detection, set the PC3004.7=1 (that is reverse).



Note: I/O unit X48.6 is the signal input point of the “spindle orientation positioning mechanical position confirmation”, which is defined by the Me1.0A version PLC. The input point position may differ depending on the different version PLC! It is necessary to view the corresponding PLC user manual when connecting.

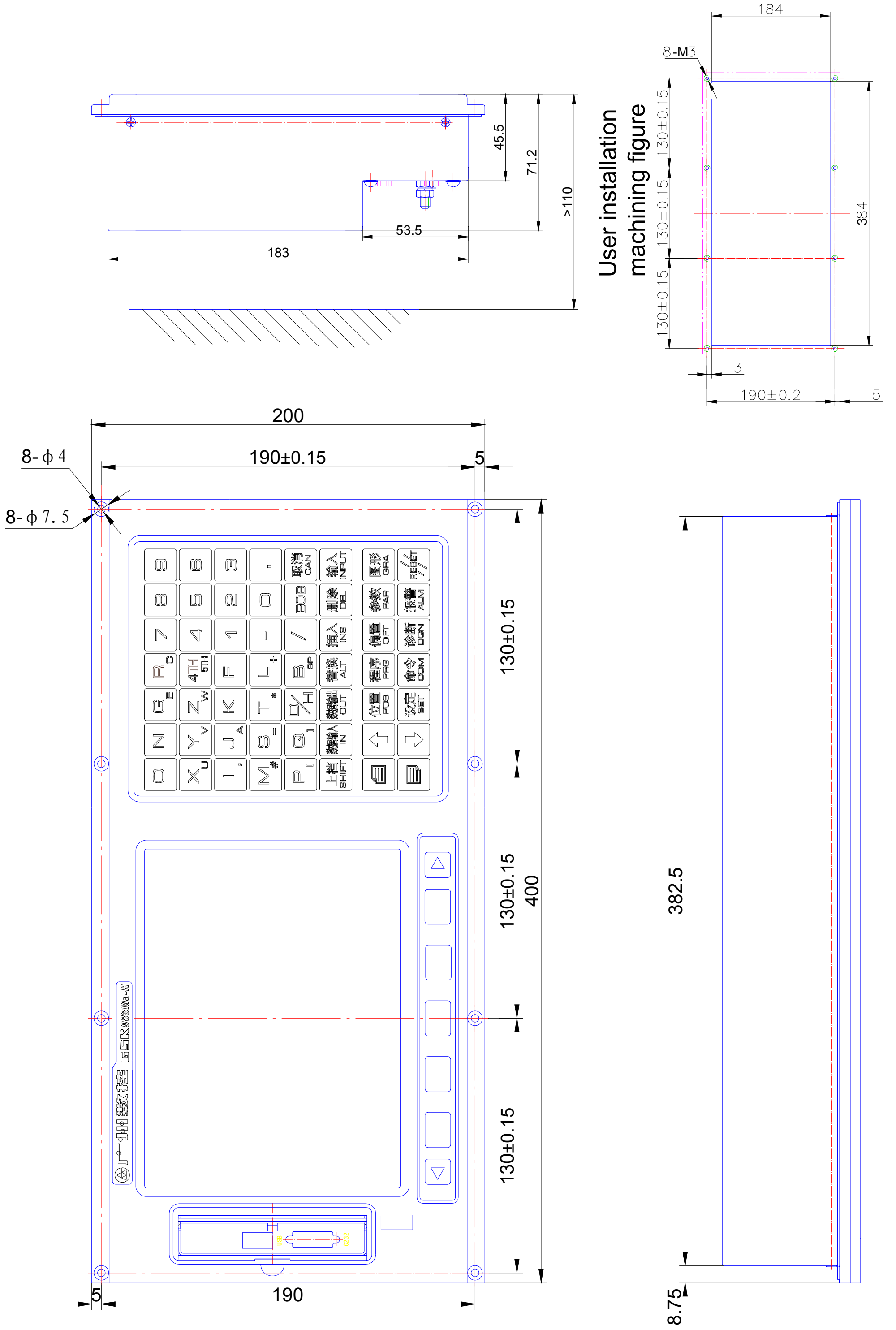
TWENTY THE RELATIVE EXPLANATION OF INSTALLING THE 2ND REFERENCE POSITION MECHANICAL POSITION DETECTION SWITCH ALONG Z AXIS

In order to further enhance the reliable of the machining center, and protect the tool magazine and tool, GSK983M system adds the 2nd reference position mechanical position confirmation signal along Z axis. The system detects both the traditional 2nd reference position signal along Z axis based on the machine zero point and the one of the mechanical position confiramtion signal during the tool change. I/O unit X48.7 is the confirmation signal input point at the tool-hold position along Z axis (that is the signal of the 2nd reference position mechanical position along Z axis). The CNC system PC parameter 3005.1 can be selected that the detection switch is constant open or close (The factory default PC parameter 3005.1=0, which is constant open switch). If it is the constant close switch, set the PC parameter 3005.1=1 (that is reverse).

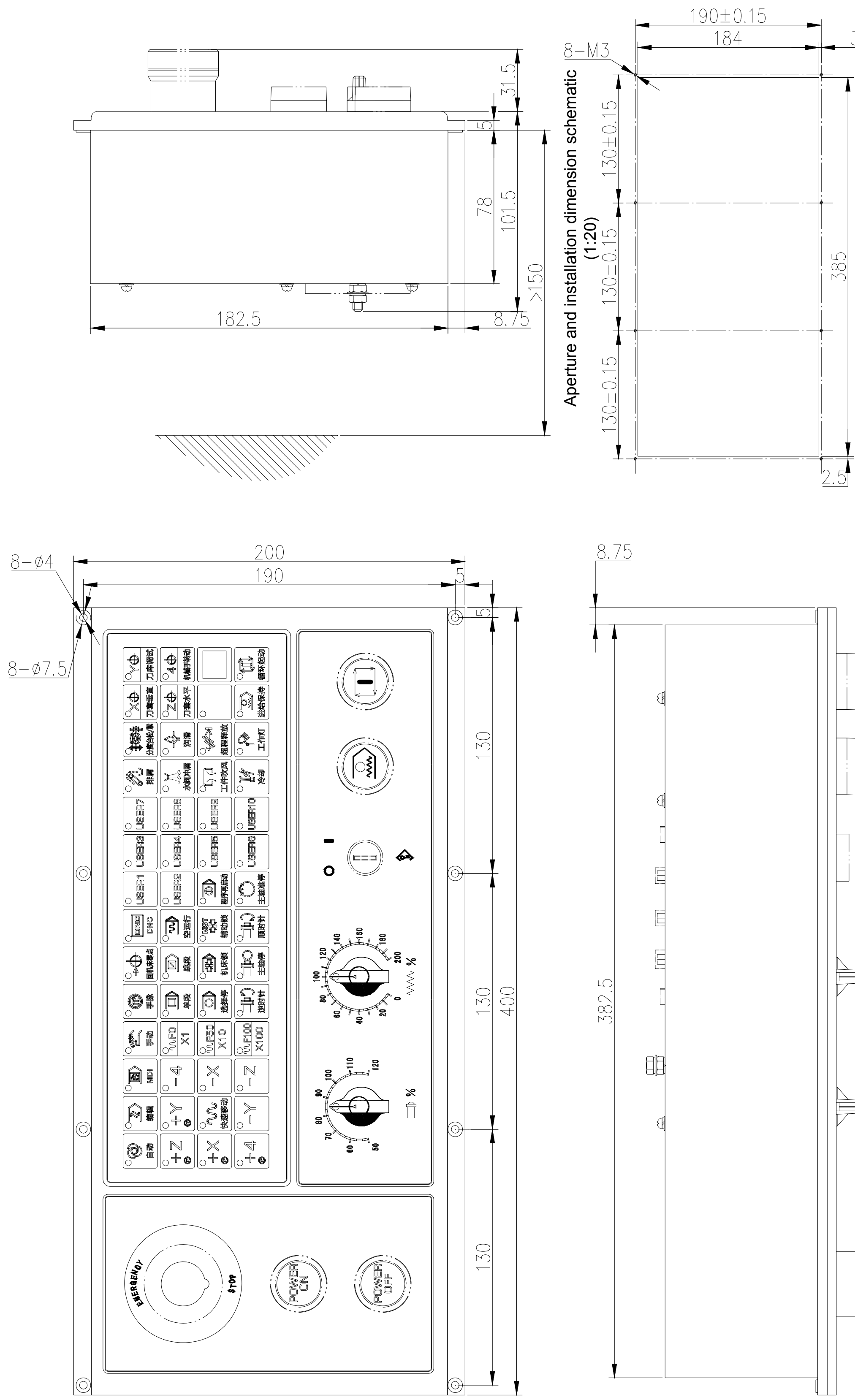
<table>
<tr><td>The installation schematic of the 2nd reference point mechanism position detection switch along Z axis</td><td>The connection schematic of the 2nd reference point mechanism position detection switch along Z axis</td></tr>
<tr><td>
</td><td>
</td></tr>
</table>

Note: I/O unit X48.7 is the signal input point of the “mechanical position confirmation along Z axis at the tool magazine tool-hold point”; it is defined by the Me1.0A version PLC. The input point position may differ depending on the different version PLC! It is necessary to view the corresponding PLC user manual when connecting.

APPENDIX ONE GSK983Ma-H/V SYSTEM INSTALLATION DIMENSION FIGURE

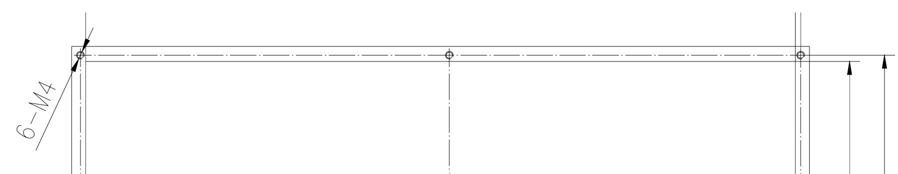


983Ma-H NC unit installation dimension

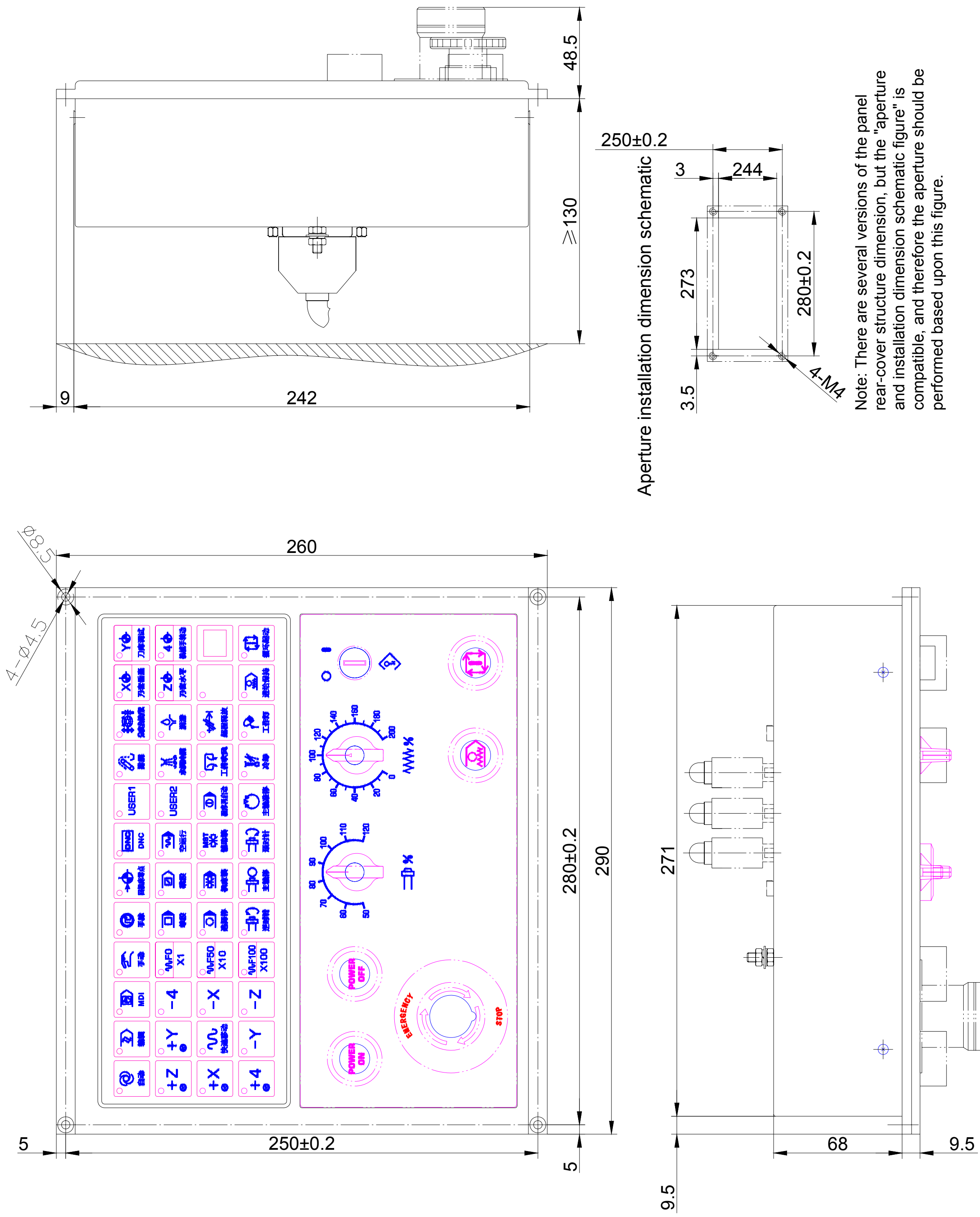


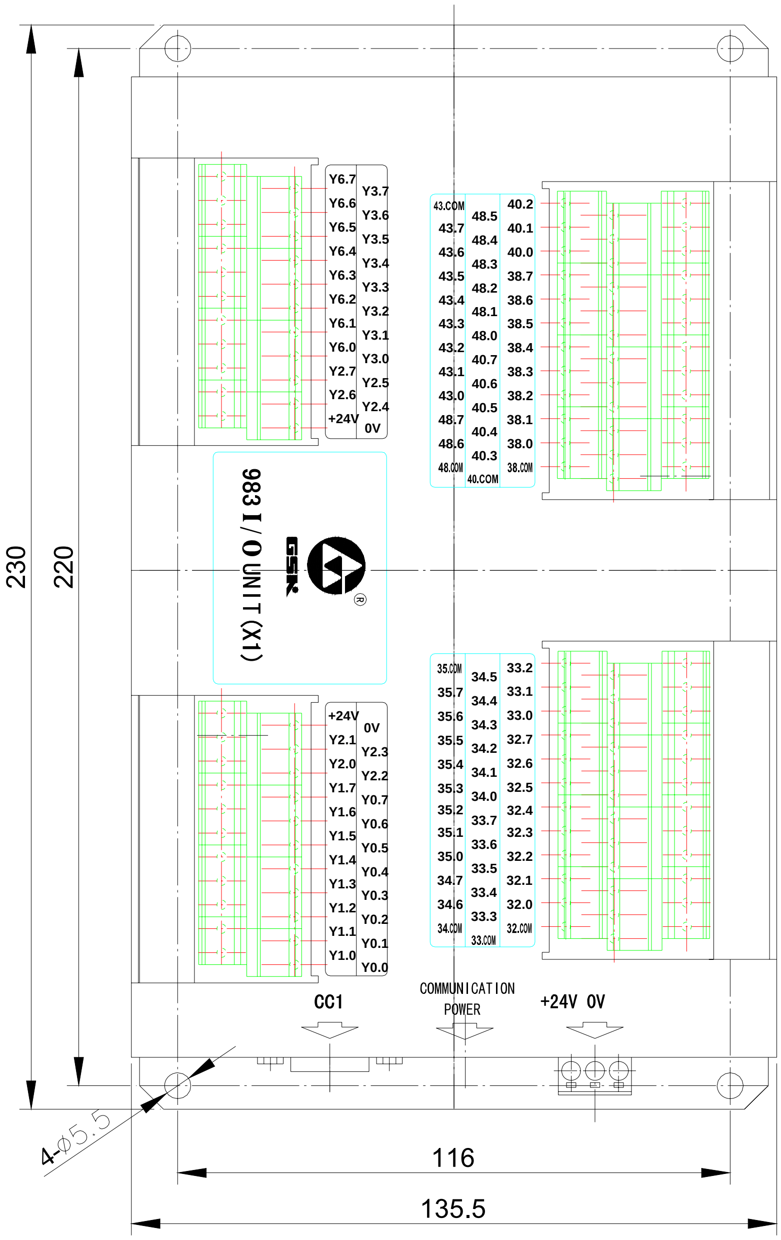
Note: There are several versions of the panel rear-cover structure dimension, but the "aperture and installation dimension schematic figure" is compatible, and therefore the aperture should be performed based upon this figure.

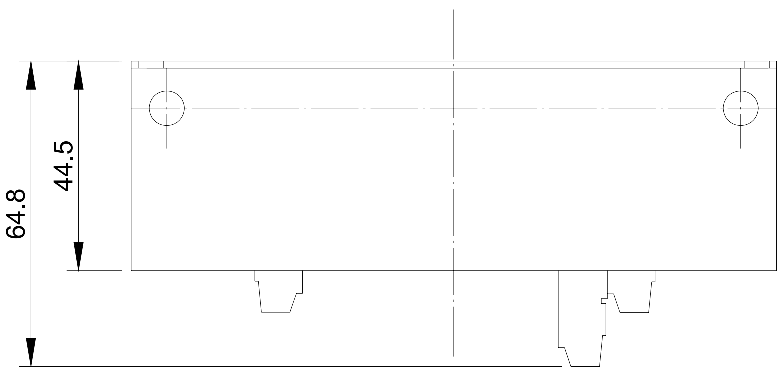
983Ma-H machine operation panel installation dimension


6-M4

983Ma-V machine operation panel installation dimension



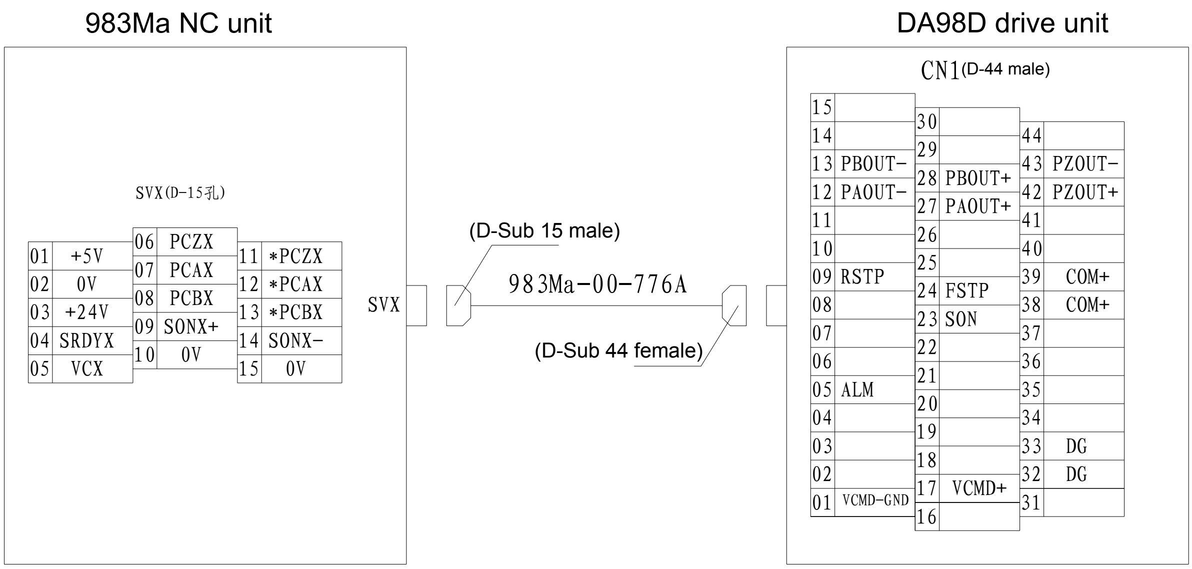


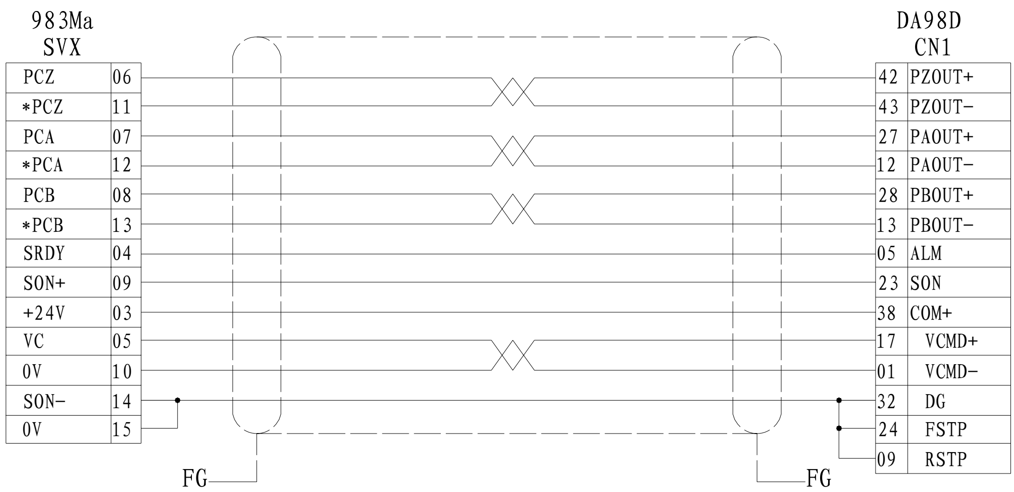


983Ma-H/V external I/O unit installation dimension

APPENDIX TWO THE CONNECTION BWTEEN NC UNIT AND DA98D DRIVE UNIT (DA98D HALTS)

I. The connection without brake



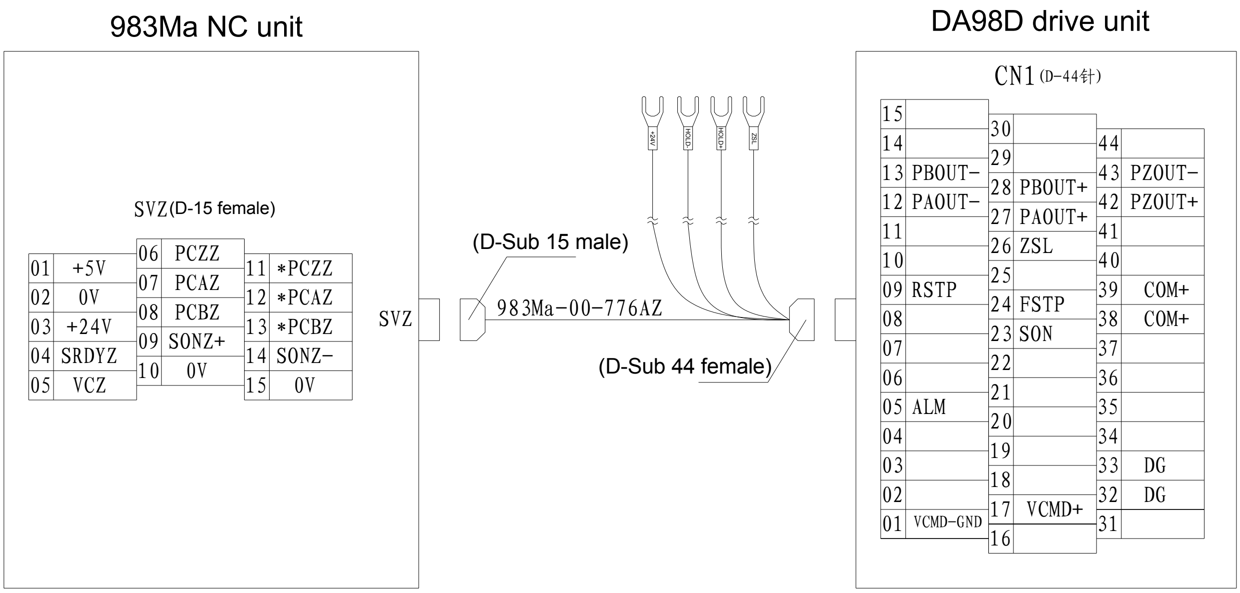


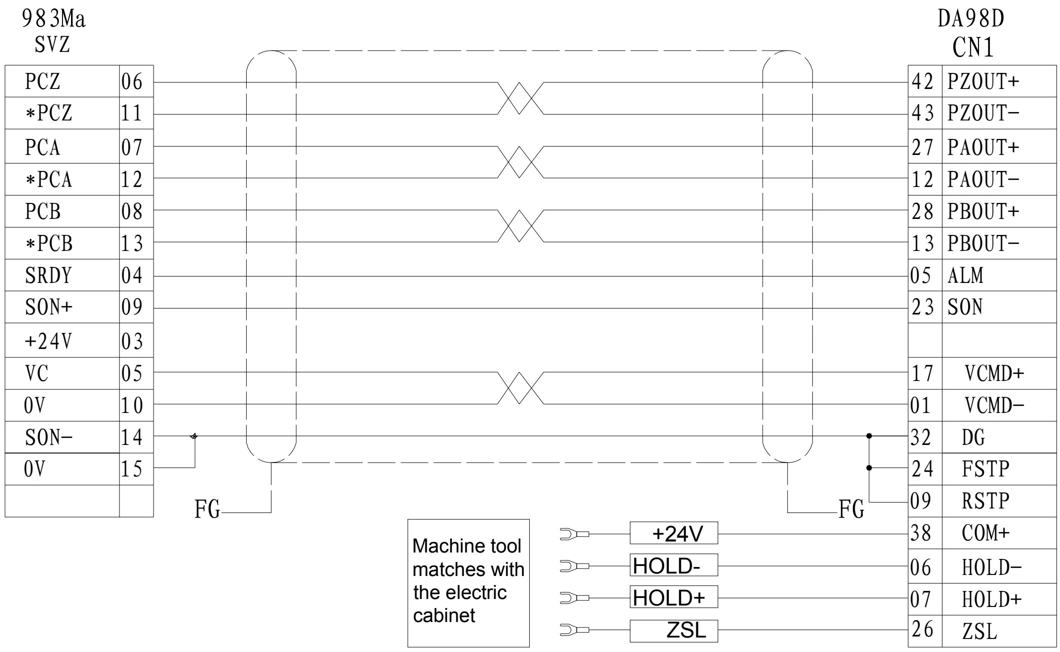
PCA *PCA: Encoder feedback phase A difference signal (Pulse signal, drive→NC)
PCB *PCB: Encoder feedback phase B difference signal (Pulse signal, drive→NC)
PCZ *PCZ: Encoder feedback phase Z difference signal (Pulse signal, drive→NC)
SON+/-: Enabling signal (Switch signal, NC→drive)
ALM: Alarm signal (Switch signal, drive→NC)
VC: Speed control voltage (DC voltage, NC→drive)

Note 1: The X, Y, Z and the 4th axes are identical when the Z axis is without brake; refer to the next page of the connection with brake along Z axis.

Note 2: The motor movement direction is conformed to the Cartesian coordinate system (It rotates CCW from the motor axis terminal, and the feed direction is positive). If change the movement direction, the No.PA46 parameter of the DA98D is set to 3 (Default value is "0").

II. The connection with brake





THE VERSION UPGRADE REGISTER TABLE OF THE GSK983Ma-H/V MILLING MACHINING CENTER CNC SYSTEM CONNECTION MANUAL

Series No.	Date	Version No.	Alteration content
1	2010-4-7	Initial version	
2	2012-3-13	The 2nd version	1. The silk-screen between the NC unit and servo drive unit connection port is changed. 2. Add the connection both the GS2000T-CA1 series feed axis servo drive unit and GS3000Y-NP2 series spindle servo drive unit. The connection of the DA98 is changed into appendix. 3. The connection with the DAP03 adds “spindle movement forbiddance” signal output. 4. Add the grating connection 5. More details of the machine operation panel interface 6. More details of the external MPG connection 7. The page is changed of the Z axis brake and the system power-on control connection method. 8. Add the page of the zero return and limit connection.